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DAQ-100-13

M E M O R A N D U M

TO: Air Quality Board

THROUGH: Bryce C. Bird, Executive Secretary

FROM: Bill Reiss, Environmental Engineer

DATE: November 25, 2013

SUBJECT: FINAL ADOPTION: Add a new SIP Subsection IX.A.21: Control Measures for Area and Point Sources, Fine Particulate Matter, $PM_{2.5}$ SIP for the Salt Lake City, UT Nonattainment Area.

On December 14, 2009, EPA designated the Salt Lake City, UT $PM_{2.5}$ Nonattainment Area. The Clean Air Act requires Utah to submit a nonattainment plan for the area no later than three years from the date of nonattainment designation. The plan must provide for the attainment of the National Ambient Air Quality Standard (NAAQS) as expeditiously as practicable, but no later than five years from the date the area was designated nonattainment, except that the Environmental Protection Agency (EPA) may extend the attainment date for a period no greater than 10 years from the date of designation.

For several years, the Utah Division of Air Quality (UDAQ), in consultation with many stakeholders along the Wasatch Front and with EPA Region 8, worked to develop a Sate Implementation Plan (SIP) for the 2006 24-hour NAAQS for $PM_{2.5}$. On September 11, 2013, the Board proposed the SIP for public comment.

During the public comment period and during the three public hearings, many comments were submitted. We have reviewed and responded to these comments in the document titled, *$PM_{2.5}$ SIP Section X.A.21 and X.A.22 Public Comments: Summaries and Responses to Comments Made During the October 2013 Public Comment Period and Public Hearings*. In response to these comments, a few changes have been made to the proposed SIP. Each of these changes involved the emissions modeled for certain point sources in the analysis year 2019. Those changes are reported individually in Table(s) 6.3. In aggregate, the changes are also reported in Tables 4.2 and 8.1.

Also during the comment period, EPA has proposed (November 15, 2013) a rule to clarify $PM_{2.5}$ implementation requirements for current 1997 and 2006 nonattainment areas. EPA is issuing the rule in response to a recent decision of the D.C. Circuit Court addressing the role subpart 4 of Part D, title 1 of the Clean air Act in implementing the fine particle pollution ($PM_{2.5}$) air quality standards. In that rule, EPA is proposing to classify areas currently designated nonattainment for the 1997 and/or 2006 $PM_{2.5}$ standards as moderate and to set the deadline of December 31, 2014, for states to submit necessary SIP elements [including new source review (NSR) provisions].

For moderate $PM_{2.5}$ nonattainment areas, the planning requirements under subpart 4 are actually quite similar to what they would be if only subpart 1 applied (see attached table). Because the SIPs prepared for the Salt Lake City and Provo nonattainment areas substantially address the subpart 4 planning requirements, it is the DAQ's intention to submit them to EPA now, and then use the ensuing time to supplement them wherever necessary. In looking specifically at these planning requirements, we see the following:

- Nonattainment NSR – Utah's permitting program already meets this requirement by operating under Appendix S to 40 CFR Part 51.

- Attainment Demonstration – The attainment demonstration prepared under subpart 1 shows that both nonattainment areas can meet the 2006 24-hour standard for $PM_{2.5}$ by 2019. Under subpart 1, this made use of the full five years available for extending the statutory attainment date of December 14, 2014. Under subpart 4, there are no such extensions available during the planning period. Therefore, the attainment date will simply be December 31, 2015. However, the obligation to submit a plan provision demonstrating attainment can take the form of a demonstration that attainment by that date is impracticable. These SIPs quantitatively demonstrate this to be the case.

- Attainment Date – See above.

- Attainment Date Extensions – See above, and note that the extensions of the attainment date available to moderate areas under Section 188(d) apply only after the State has submitted its SIP and the attainment date has passed. They are more or less probationary.

- Reasonably Available Control Measure (RACM) / Reasonable Available Control Technology (RACT) – This requirement is the same in either case.

- Reasonable Further Progress (RFP) / Quantitative Milestones – The current plans address RFP in Chapter(s) 8, and use the planning years 2014 and 2017 as milestones for evaluating progress toward attainment. Under subpart 4, the milestones identified in Section 189(c) come into play only after the State has submitted its SIP.

- Contingency Measures – This requirement is the same in either case.

- Precursor Policy – Under EPA's $PM_{2.5}$ Implementation Rule developed with attention to subpart 1, each precursor carried a presumption concerning whether it would be appropriate to control the emissions thereof under the plan. Recall that for both volatile organic compound (VOC) and ammonia that presumption was to leave out of the plan any emission controls of these compounds. Utah reversed that presumption for VOC, but found no reasonable controls that would have an impact on $PM_{2.5}$ concentrations in the nonattainment areas. Therefore, DAQ affirmed that the EPA's presumption regarding ammonia would be appropriate. Under subpart 4, each precursor is regarded as warranting emission controls. DAQ believes it will have to re-visit this assumption as a supplement to the current analysis.

Fundamentally, none of these items is different enough so as to suggest starting over, and the entirety of their agreement with subpart 4 suggests that these SIPs already substantially meet these requirements. After consulting with EPA Region 8, we conclude that the best path forward is to submit them now to EPA, and to use the coming year to supplement the package where needed to address subpart 4.

Staff Recommendation: Staff recommends the Board adopt SIP Subsection IX.A.21: Control Measures for Area and Point Sources, Fine Particulate Matter, $PM_{2.5}$ SIP for the Salt Lake, UT Nonattainment Area as amended.

UTAH

State Implementation Plan

Control Measures for Area and Point Sources, Fine Particulate Matter,

$PM_{2.5}$ SIP for the Salt Lake City, UT Nonattainment Area

Section IX. Part A.21

Adopted by the Utah Air Quality Board

December 04, 2013

Acronyms

BACT	Best Available Control Technology
CAA	Clean Air Act
CFR	Code of Federal Regulations
CMAQ	Community Multiscale Air Quality
CTG	Control Techniques Guideline Documents
DAQ	Utah Division of Air Quality (also UDAQ)
EPA	Environmental Protection Agency
FRM	Federal Reference Method
MACT	Maximum Available Control Technology
MATS	Model Attainment Test Software
MPO	Metropolitan Planning Organization
$\mu g/m^3$	Micrograms Per Cubic Meter
Micron	One Millionth of a Meter
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NH_3	Ammonia
NO_x	Nitrogen Oxides
NSPS	New Source Performance Standard
NSR	New Source Review
PM	Particulate Matter
PM_{10}	Particulate Matter Smaller Than 10 Microns in Diameter

$PM_{2.5}$	Particulate Matter Smaller Than 2.5 Microns in Diameter
RACM	Reasonably Available Control Measures
RACT	Reasonably Available Control Technology
RFP	Reasonable Further Progress
SIP	State Implementation Plan
SMOKE	Sparse Matrix Operator Kernal Emissions
SO_2	Sulfur Dioxide
SO_x	Sulfur Oxides
TSD	Technical Support Document
VOC	Volatile Organic Compounds
UAC	Utah Administrative Code
WRF	Weather Research and Forecasting

Table of Contents

Chapter 7 – TRANSPORTATION CONFORMITY

Chapter 8 – REASONABLE FURTHER PROGRESS

Chapter 9 – CONTINGENCY MEASURES

List of Figures

List of Tables

Chapter 1 – INTRODUCTION AND BACKGROUND

1.1 Fine Particulate Matter

According to EPA's website, particulate matter, or PM, is a complex mixture of extremely small particles and liquid droplets. Particulate matter is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

The size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. Other negative effects are reduced visibility and accelerated deterioration of buildings.

EPA groups particle pollution into two categories:

- "Inhalable coarse particles," such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter. Utah has previously addressed inhalable coarse particles as part of its PM_{10} SIPs for Salt Lake and Utah Counties, but this fraction is not measured as $PM_{2.5}$ and will not be a subject for this nonattainment SIP.

- "Fine particles," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller and thus denoted as $PM_{2.5}$. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air.

PM concentration is reported in micrograms per cubic meter or $\mu g/m^3$. The particulate is collected on a filter and weighed. This weight is combined with the known amount of air that passed through the filter to determine the concentration in the air.

1.2 Health and Welfare Impacts of $PM_{2.5}$

Numerous scientific studies have linked particle pollution exposure to a variety of problems, including:

- increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing, for example;
- decreased lung function;
- aggravated asthma;
- development of chronic bronchitis;
- irregular heartbeat;
- nonfatal heart attacks; and

- pre-mature death in people with heart or lung disease.

People with heart or lung diseases, children and older adults are the most likely to be affected by particle pollution exposure. However, even healthy people may experience temporary symptoms from exposure to elevated levels of particle pollution.

1.3 Fine Particulate Matter in Utah

Excluding wind-blown desert dust events, wild land fires, and holiday related fireworks, elevated $PM_{2.5}$ in Utah occurs when stagnant cold pools develop during the winter season.

The synoptic conditions that lead to the formation of cold pools in Utah's nonattainment areas are: synoptic scale ridging, subsidence, light winds, snow cover (often), and cool- to-cold surface temperatures. These conditions occur during winter months, generally mid-November through early March.

During a winter-time cold pool episode, emissions of $PM_{2.5}$ precursors react quickly to elevate overall concentrations, and of course dispersion is very poor due to the very stable air mass. Episodes may last from a few days to tens of days when meteorological conditions change to once again allow for good mixing.

The scenario described above leads to exceedances and violations of the 24-hour health standard for $PM_{2.5}$. In other parts of the year concentrations are generally low, and even with the high peaks incurred during winter, are well within the annual health standard for $PM_{2.5}$.

1.4 2006 NAAQS for $PM_{2.5}$

In September of 2006, EPA revised the (1997) standards for $PM_{2.5}$. While the annual standard remained unchanged at 15 $\mu g/m^3$, the 24-hr standard was lowered from 65 $\mu g/m^3$ to 35 $\mu g/m^3$.

DAQ has monitored $PM_{2.5}$ since 2000, and found that all areas within the state have been in compliance with the 1997 standards. At this new 2006 level, all or parts of five counties have collected monitoring data that is not in compliance with the 24-hr standard.

In 2013, EPA lowered the annual average to 12 $\mu g/m^3$. Monitoring data shows no instances of noncompliance with this revised standard.

1.5 $PM_{2.5}$ Nonattainment Areas in Utah

There are two distinct nonattainment areas for the 2006 $PM_{2.5}$ standards residing entirely within the state of Utah. These are the Salt Lake City, UT, and Provo, UT nonattainment areas, which together encompass what is referred to as the Wasatch Front. A third nonattainment area is more or less geographically defined by the Cache Valley which straddles the border between Utah and Idaho (the Logan, UT – ID nonattainment area.) Figure 1.1 below shows the geographic extent of these areas.

None of these three areas has violated the annual NAAQS for $PM_{2.5}$. Without exception, the exceedances leading to 24-hr NAAQS violations are associated with relatively short-term meteorological occurrences.

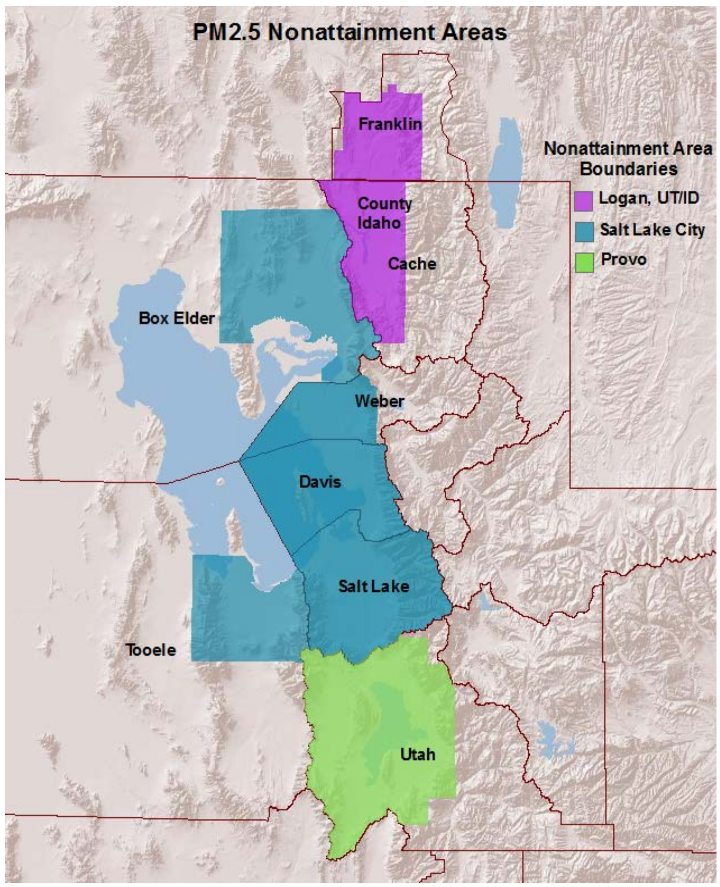


Figure 1.1, Nonattainment Areas for the 2006 $PM_{2.5}$ NAAQS

Each of these three areas was designated, by the EPA, based on the weight of evidence of the following nine factors recommended in its guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization

- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

EPA also used analytical tools and data such as pollution roses, fine particulate composition monitoring data, back trajectory analyses, and the contributing emission score (CES) to evaluate these areas.

While the general meteorological characteristics are identical between the Wasatch Front and Cache Valley, there are two important differences related to topography. First, the Cache Valley is a closed basin while the Wasatch Front has many large outlets that connect it to the larger Great Basin. The large outlets along the Wasatch Front provide the potential for greater advection of pollutants and for a potentially weaker cold pool. Second, the Cache Valley is a narrow (<20 km) valley bordered by extremely steep mountains. These topographical differences lead to faster forming, more intense, and more persistent cold pools in Cache Valley relative to the Wasatch Front.

Because of these differences, the two Wasatch Front areas and the Cache Valley are designated as separate nonattainment areas; however, they will all be modeled together within the same modeling domain.

1.6 $PM_{2.5}$ Attainment Plan Precursors

The majority of ambient $PM_{2.5}$ collected during a typical cold-pool episode of elevated concentration is secondary particulate matter, born of precursor emissions. The main precursor gasses associated with fine particulate matter are discussed in EPA's Clean Air Particulate Implementation Rule (FR 72, 20586), and there are certain presumptions about each of these concerning how they are to be treated in a given attainment plan. It is important that this plan identify which of these will be evaluated for the purpose of developing control measures.

- Sulfur Dioxide (SO_2) is to be evaluated for control measures in all nonattainment areas. SO_2 is therefore to be considered as a $PM_{2.5}$ attainment plan precursor.

- Oxides of Nitrogen (NO_x) are presumed to be evaluated for control measures in any given nonattainment area, unless it can be demonstrated that it is not a significant contributor to $PM_{2.5}$ concentrations. No such demonstration will be made as part of this plan. Therefore, NO_x will be considered as a $PM_{2.5}$ attainment plan precursor.

- Volatile Organic Compounds (VOC) are presumed not to be evaluated for control measures in any given nonattainment area, unless it can be demonstrated that it is in fact a significant contributor to $PM_{2.5}$ concentrations. The air modeling that underlies this SIP demonstration does in fact indicate that $PM_{2.5}$ concentrations are very sensitive to VOC concentrations. As such, VOC is to be considered a significant contributor to $PM_{2.5}$ concentrations and will be considered as a $PM_{2.5}$ attainment plan precursor. Additional information concerning a demonstration to this effect is included in the Technical Support Document.

1.7 Other $PM_{2.5}$ Precursors – Ammonia

Ammonia (NH_3) is another precursor gas associated with fine particulate matter. Like VOC, the Clean Air Particulate Implementation Rule presumes that ammonia would not be evaluated for control measures in any given nonattainment area, unless it can be demonstrated that it is in fact a significant contributor to $PM_{2.5}$ concentrations. Most of the secondary particulate matter collected during cold-pool conditions is ammonium nitrate. Still, there is every indication that in each of the airsheds evaluated with the air model there is a large surplus of ammonia relative to what would be required to produce the observed ammonium nitrate. Sensitivity runs with the model indicate that significant reductions in the inventories of ammonia have little to no effect on predicted $PM_{2.5}$ concentrations. Because the modeled cuts in ammonia emissions were well beyond what might be considered as reasonable or even best controls, ammonia will not be identified as a $PM_{2.5}$ attainment plan precursor.

Chapter 2 – REQUIREMENTS FOR 2006 $PM_{2.5}$ PLAN REVISIONS

2.1 Requirements for Nonattainment SIPs

Section 110 of the Clean Air Act lists the requirements for implementation plans. Many of these requirements speak to the administration of an air program in general. Section 172 of the Act contains the plan requirements for nonattainment areas. Some of the more notable requirements identified in these sections of the Act that pertain to this SIP include:

- Implementation of Reasonably Available Control Measures (RACM) as expeditiously as practicable
- Reasonable Further Progress (RFP) toward attainment of the National Ambient Air Quality Standards by the applicable attainment date
- Enforceable emission limits as well as schedules for compliance
- A comprehensive inventory of actual emissions
- Contingency measures to be undertaken if the area fails to make reasonable further progress or attain the NAAQS by the applicable attainment date

More specific requirements for the preparation, adoption, and submittal of implementation plans are specified in 40 CFR Part 51. Subpart Z of Part 51 contains provisions for Implementation of $PM_{2.5}$ National Ambient Air Quality Standards.

2.2 $PM_{2.5}$ Implementation Rule

Beyond what has been codified in Subpart Z of Part 51 concerning the Implementation of the $PM_{2.5}$ NAAQS, EPA provides additional clarification and guidance in its Clean Air Particulate Implementation Rule for the 1997 $PM_{2.5}$ NAAQS (FR 72, 20586) and its subsequent Implementation Guidance for the 2006 24-Hour Fine Particle NAAQS (March 2, 2012).

2.3 Summary of this SIP Proposal

This implementation plan was developed to meet the requirements specified in the law, rule, and appropriate guidance documents identified above. Discussed in the following chapters are: air monitoring, reasonably available control measures, modeled attainment demonstration, emission inventories, reasonable further progress toward attainment, and contingency measures. Additional information is provided in the technical support document.

Chapter 3 – Ambient Air Quality Data

3.1 Measuring Fine Particle Pollution in the Atmosphere

Utah has monitored $PM_{2.5}$ in its airsheds since 2000 following the promulgation of the 1997 $PM_{2.5}$ NAAQS which was set at 65 µg/m^3. $PM_{2.5}$ monitoring sites were initially located based on concentrations of PM_{10}, which historically were measured at sites located based on emissions of primary particles. $PM_{2.5}$ concentrations, especially during Utah's wintertime valley temperature inversions, tend to be distributed more homogenously within a specific airshed. Homogeneity of $PM_{2.5}$ concentrations means that one or two monitors are adequate to determine compliance with the NAAQS in specific airsheds. DAQ's monitors are appropriately located to assess concentration, trends, and changes in $PM_{2.5}$ concentrations. During Utah's wintertime cold-pool episodes, every day sampling and real time monitoring are needed for modeling and public notification.

3.2 Utah's Air Monitoring Network

The Air Monitoring Center (AMC) maintains an ambient air monitoring network in Utah that collects both air quality and meteorological data. Figure 3.1 shows the location of sites along the Wasatch Front that collect $PM_{2.5}$ data. Twelve sites collect $PM_{2.5}$ data using the Federal Reference Method (FRM); $PM_{2.5}$ is collected on filters over a 24 hour period and its mass is measured gravimetrically. Seven of those sites also measure $PM_{2.5}$ concentrations continuously in real-time. Real-time $PM_{2.5}$ data is useful both for pollution forecasting and to compare with 24-hour concentrations of $PM_{2.5}$ collected on filters. Of the twelve sites that use the FRM to measure $PM_{2.5}$, six sites collect $PM_{2.5}$ data daily and six sites collect $PM_{2.5}$ data on every third day. Three sites along the Wasatch Front collect speciated $PM_{2.5}$; the particulate matter on the speciated $PM_{2.5}$ filters is analyzed for organic and inorganic carbon and a list of 48 elements. $PM_{2.5}$ speciation data is particularly useful in helping to identify sources of particulate matter. The ambient air quality monitoring network along Utah's Wasatch Front meets EPA requirements for monitoring networks.

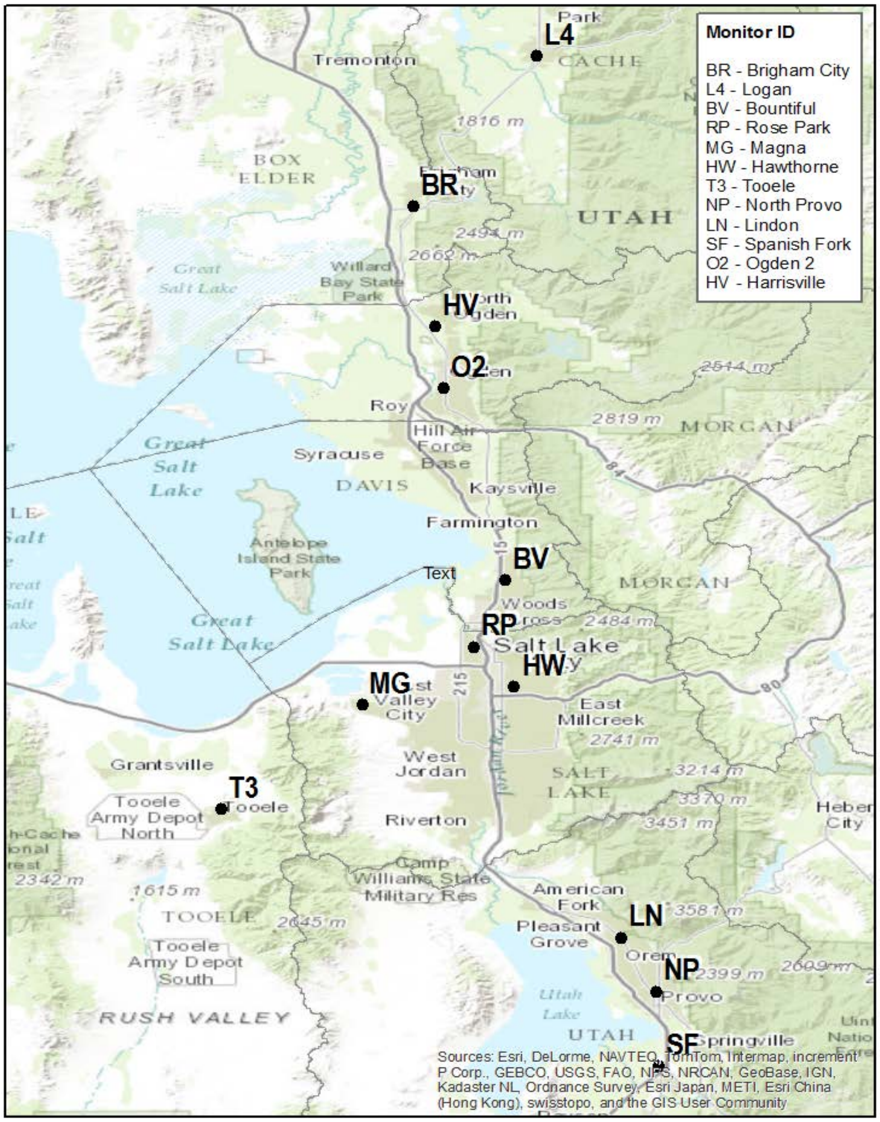


Figure 3.1, Utah's $PM_{2.5}$ Air Monitoring Network

3.3 Annual $PM_{2.5}$ – Mean Concentrations

The procedure for evaluating $PM_{2.5}$ data with respect to the NAAQS is specified in Appendix N to 40 CFR Part 50. Generally speaking, the annual $PM_{2.5}$ standard is met when a three-year average of annual mean values is less than or equal to 12.0 µg/m^3. Each annual mean is itself an average of four quarterly averages.

Table 3.1, below shows the running 3-year averages of annual mean values for each of the monitoring locations along the Wasatch Front. It can be seen from the data that there are no locations at which the annual NAAQS has been violated.

		3-Year Average of Annual Mean Concentrations		
Location	**County**	**08 - 10**	**09 - 11**	**10 - 12**
Brigham City	Box Elder	8.3	8.2	7.7
Ogden 2 (POC 1)	Weber	9.7	9.5	9.1
Harrisville	Weber	8.6	8.3	7.6
Bountiful	Davis	9.8	9.2	8.3
Rose Park (POC 1)	Salt Lake	10.4	9.7	9.2
Magna	Salt Lake	8.5	8.4	7.7
Hawthorn (POC 1)	Salt Lake	10.4	9.7	8.8
Tooele	Tooele	6.8	6.8	6.3
Lindon (POC 1)	Utah	9.8	9.1	8.3
North Provo	Utah	9.4	8.7	8.1
Spanish Fork	Utah	8.8	8.5	7.7

Table 3.1, $PM_{2.5}$ Annual Mean Concentrations

3.4 Daily $PM_{2.5}$ – Averages of 98^{th} Percentiles and Design Values

The procedure for evaluating $PM_{2.5}$ data with respect to the NAAQS is specified in Appendix N to 40 CFR Part 50. Generally speaking, the 24-hr. $PM_{2.5}$ standard is met when a three-year average of 98^{th} percentile values is less than or equal to 35 µg/m^3. Each year's 98^{th} percentile is the daily value below which 98% of all daily values fall.

Table 3.2, below shows the running 3-year averages of 98^{th} percentile values for each of the monitoring locations along the Wasatch Front. It can be seen from the data that there are many locations at which the 24-hr. NAAQS has been violated, and this SIP has been structured to specifically address the 24-hr. standard.

Site-Specific Baseline Design Values:		3-Year Average of 98th Percentiles			Baseline Design Value
Location	County	08 - 10	09 - 11	10 - 12	
Brigham City	Box Elder	42	40	37	**39.9**
Ogden 2 (POC 1)	Weber	37	41	37	**38.5**
Harrisville	Weber	36	37	33	**35.1**
Bountiful	Davis	38	40	34	**37.5**
Rose Park (POC 1)	Salt Lake	41	41	35	**39.0**
Magna	Salt Lake	33	35	30	**32.5**
Hawthorn (POC 1)	Salt Lake	44	45	38	**42.1**
Tooele	Tooele	26	27	24	**25.8**
Lindon (POC 1)	Utah	41	41	32	**37.9**
North Provo	Utah	36	35	29	**33.4**
Spanish Fork	Utah	39	42	35	**38.5**

Table 3.2, 24-hour $PM_{2.5}$ Monitored Design Values

As mentioned in the foregoing paragraph, this SIP is structured to address the 24-hr. $PM_{2.5}$ NAAQS. As such the modeled attainment test must consider monitored baseline design values from each of these locations. EPA's modeling guidance[1] recommends this be calculated using three-year averages of the 98th percentile values. To calculate the monitored baseline design value, EPA recommends an average of three such three-year averages that straddle the baseline inventory. 2010 is the year represented by the baseline inventory. Therefore, the three-year average of 98th percentile values collected from 2008-2010 would be averaged together with the three-year averages for 2009-2011 and 2010-2012 to arrive at the site-specific monitored baseline design values. These values are also shown in Table 3.2.

3.5 Composition of Fine Particle Pollution – Speciated Monitoring Data

DAQ operates three $PM_{2.5}$ speciation sites. The Hawthorne site in Salt Lake County is one of 54 Speciation Trends Network (STN) sites operated nationwide on an every-third-day sampling schedule. Sites at Bountiful/Viewmont in Davis County and Lindon in Utah County are State and Local Air Monitoring Stations (SLAMS) $PM_{2.5}$ speciation sites that operate on an every-sixth-day sampling schedule.

Filters are prepared by the EPA contract laboratory and shipped to Utah for sampling. Samples are collected for particulate mass, elemental analysis, identification of major cations and anions, and concentrations of elemental and organic carbon as well as crustal material present in $PM_{2.5}$. Carbon sampling and analysis changed in 2007 to match the Interagency Monitoring of Protected Visual Environments (IMPROVE) method using a modified IMPROVE sampler at all sites.

[1] Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze (EPA -454B-07-002, April 2007)

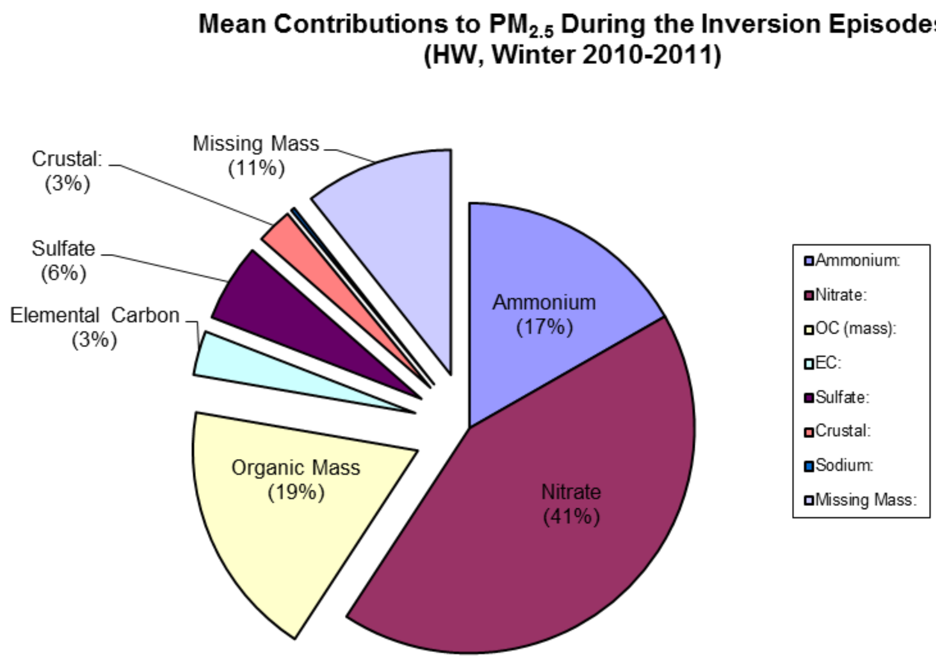
The $PM_{2.5}$ is collected on three types of filters: Teflon, nylon, and quartz. Teflon filters are used to characterize the inorganic contents of $PM_{2.5}$. Nylon filters are used to quantify the amount of ammonium nitrate, and quartz filters are used to quantify the organic and inorganic carbon content in the ambient $PM_{2.5}$.

Data from the speciation network show the importance of volatile secondary particulates during the colder months. These particles are significantly lost in FRM $PM_{2.5}$ sampling.

During the winter periods between 2009 and 2011, DAQ conducted special winter speciation studies aimed at better characterization of $PM_{2.5}$ during the high pollution episodes. These studies were accomplished by shifting the sampling of the Chemical Speciation Network monitors to 1-in-2-day schedule during the months of January and February. Speciation monitoring during the winter high-pollution episodes produced similar results in $PM_{2.5}$ composition each year.

The results of the speciation studies lead to the conclusion that the exceedances of the $PM_{2.5}$ NAAQS are a result of the increased portion of the secondary $PM_{2.5}$ that was chemically formed in the air and not primary $PM_{2.5}$ emitted directly into the troposphere.

Figure 3.2 below shows the contribution of the identified compounds from the speciation sampler both during a winter temperature inversion period and during a well-mixed winter period.



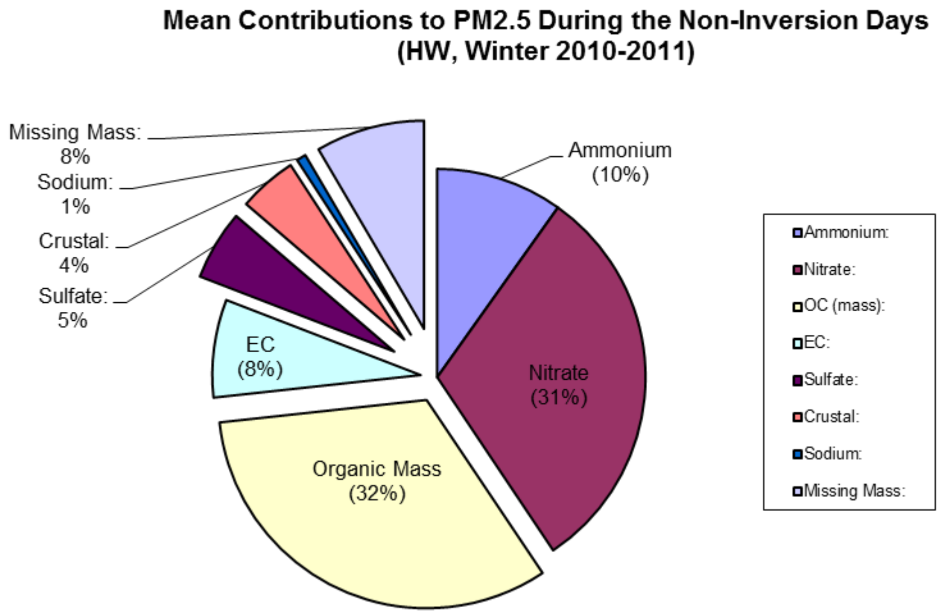


Figure 3.2, Composite Wintertime $PM_{2.5}$ Speciation Profiles

3.6 PCAP Study

The Persistent Cold Air Pooling Study (PCAPS) is an ongoing National Science Foundation-funded project conducted by the University of Utah to investigate the processes leading to the formation, maintenance and destruction of persistent temperature inversions in Salt Lake Valley. Field work for the project was conducted in the winter of 2010-2011 and focused on the meteorological dynamics of temperature inversions in the Salt Lake Valley and in the Bingham Canyon pit mine in the southwest corner of Salt Lake Valley. In addition to identifying key meteorological processes involved in the dynamics of temperature inversions in Salt Lake Valley, the other primary objectives of PCAPS is to determine how persistent temperature inversions affect air pollution transport and diffusion in urban basins and to develop more accurate meteorological models describing the formation, persistence and dispersion of temperature inversions in Salt Lake Valley.

Analyses of most data sets collected during the PCAPS are still underway. However, one study examining $PM_{2.5}$ concentrations along an elevation gradient north of Salt Lake City (1300-1750 meters) showed that $PM_{2.5}$ concentrations generally decreased with altitude and increased with time during a single temperature inversion event.[1] Final results from PCAPS will help DAQ understand both how persistent temperature inversions affect $PM_{2.5}$ concentrations along the Wasatch Front and will enhance DAQ's ability to accurately forecast the formation and breakup of temperature inversion that lead to poor wintertime air quality.

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[1] Silcox, G.D., K.E. Kelly, E.T. Crosman, C.D. Whiteman, and B.L. Allen, 2012: Wintertime $PM_{2.5}$ concentrations in Utah's Salt Lake Valley during persistent multi-day cold air pools. Atmospheric Environment, **46**, 17-24.

3.7 Ammonia (NH_3) Studies

The Division of Air Quality deployed an ammonia monitor as a part of the special winter study for 2009. A URG 9000 instrument was used to record hourly values of ambient ammonia between the months of December and February.

The resulting measurements showed that the ambient concentration of ammonia tended to be generally an order of magnitude higher than those of nitric acid: 12-17 ppbv and 1-2 ppbv, respectively.

Unfortunately, the use of the instrument proved to be excessively labor intensive due to the high frequency of calibrations and corrections for drift. The data obtained during the winter of 2009, albeit valuable for rough estimation of the ambient ammonia concentrations, contained an abnormal amount of error for accurate mechanistic analysis.

Chapter 4 – EMISSION INVENTORY DATA

4.1 Introduction

The emissions inventory is one means used by the state to assess the level of pollutants and precursors released into the air from various sources. The methods by which emissions inventories are collected and calculated are constantly improving in response to better analysis and more comprehensive rules. The inventories underlying this SIP were compiled using the best information available.

The sources of emissions that were inventoried may be discussed as belonging to four general categories: industrial point sources; on-road mobile sources; off-road mobile sources; and area sources which represent a collection of smaller, more numerous point sources, residential activities such a home heating, and in some cases biogenic emissions.

This SIP is concerned with $PM_{2.5}$, both primary in its origin and secondary, referring to its formation removed in time and space from the point of origin for certain precursor gasses. Hence, the pollutants of concern, at least for inventory development purposes, included $PM_{2.5}$, SO_2, NO_x, VOC, and NH_3.

On-road mobile sources are inventoried using EPA's MOVES model, in conjunction with information generated by travel demand models such as vehicle speeds and miles traveled. The inventory information is calculated in units of tons per day, adjusted for winter conditions. Emissions from the other three categories are calculated in terms of tons per year.

Prior to use in the air quality model, the emissions are pre-processed to account for the seasonality of Utah's difficulty with secondary $PM_{2.5}$ formation during winter months. These temporal adjustments also account for daily and weekly activity patterns that affect the generation of these emissions.

To acknowledge the episodic and seasonal nature of Utah's elevated $PM_{2.5}$ concentrations, inventory information presented herein is, unless otherwise noted, a reflection of the temporal adjustments made prior to air quality modeling. This makes more appropriate the use of these inventories for such purposes as correlation with measured $PM_{2.5}$ concentrations, control strategy evaluation, establishing budgets for transportation conformity, and tracking rates of progress.

There are various time horizons that are significant to the development of this SIP. It is first necessary to look at past episodes of elevated $PM_{2.5}$ concentrations in order to develop the air quality model. The episodes studied as part of the SIP occurred in 2007, 2008, 2009, and 2010. It is then necessary to look several years into the future when developing emission control strategies. The significant time horizons relate to the statutory attainment dates associated with the 2006 $PM_{2.5}$ NAAQS. These dates may range from 2014 to 2019. Such projections are made as comparisons to a baseline inventory that is contemporaneous with the monitored design values discussed in Section 3.4. This baseline is represented by the year 2010. Inventories must be prepared to evaluate all of these time horizons.

4.2 The 2008 Emissions Inventory

The forgoing paragraph identified numerous points in time for which an understanding of emissions to the air is important to plan development. The basis for each of these assessments was the 2008 tri-annual inventory. This inventory represented, at the time it was selected for use, the most recent comprehensive inventory compiled by UDAQ. In addition to the large major point sources that are required to report emissions every year, the tri-annual inventories consider emissions from many more, smaller point sources. These inventories are collected in accordance with state and federal rules that ensure proper methods and comprehensive quality assurance.

Thus, to develop other inventories for each of the years discussed above, the 2008 inventory was either back-cast and adjusted for certain episodic conditions, or forecast to represent more typical conditions.

4.3 Characterization of Utah's Airsheds

As said at the outset, an emissions inventory provides a means to assess the level of pollutants and precursors released into the air from various sources. This in turn allows for an overall assessment of a particular airshed or even a comparison of one airshed to another.

The modeling analysis used to support this SIP considers a regional domain that encompasses two distinct airsheds defining the nonattainment areas along the Wasatch Front: the central Wasatch Front (Salt Lake City, UT nonattainment area), and the southern Wasatch Front (Provo, UT nonattainment area).

The inventories developed for each of these areas illustrate many similarities but also a few notable differences. They are both more or less dominated by a combination of on-road mobile and area sources. However, emissions from large point sources are more prominent in the Salt Lake City nonattainment area, where they are clustered in Salt Lake and Davis counties.

The tables presented below provide a broad overview of the emissions in the respective areas. They are organized to show the relative contributions of emissions by source category (e.g. point / area / mobile).

Table 4.1 shows the 2010 Baseline emissions in each area of the modeling domain.

2010 Baseline	NA-Area	Source Category	PM2_5	NOX	VOC	NH3	SO2
2010 Baseline Sum of Emissions (tpd)	Provo NA	Area Sources	1.86	5.56	12.77	6.53	0.28
		Mobile Sources	2.20	25.39	15.63	0.44	0.16
		NonRoad	0.31	4.40	1.71	0.00	0.09
		Point Source	0.26	0.93	0.67	0.29	0.03
		Provo NA Total	**4.64**	**36.28**	**30.79**	**7.26**	**0.56**
	Salt Lake City NA	Area Sources	5.87	17.71	51.53	17.96	0.88
		Mobile Sources	8.59	99.63	62.51	1.86	0.63
		NonRoad	1.27	23.04	9.50	0.01	0.66
		Point Source	3.89	20.14	6.48	0.64	10.64
		Salt Lake City NA Total	**19.62**	**160.51**	**130.02**	**20.47**	**12.81**
	Surrounding Areas	Area Sources	2.32	4.73	18.75	38.60	1.40
		Mobile Sources	2.98	35.37	16.02	0.45	0.17
		NonRoad	0.70	8.89	12.94	0.00	0.16
		Point Source	3.35	129.31	3.55	0.75	43.40
		Surrounding Areas Total	**9.35**	**178.30**	**51.25**	**39.81**	**45.13**
		2010 Total	**33.60**	**375.09**	**212.06**	**67.54**	**58.49**

Table 4.1, Emissions Summary for 2010 (SMOKE)

Table 4.2 is specific to the Salt Lake, UT nonattainment area, and shows emissions for the attainment year as well as any other significant milestone year. These subsequent totals include projections concerning growth in population, vehicle miles traveled, and the economy. They also include the effects of emissions control strategies that are either already promulgated or were required as part of the SIP.

Year	NA-Area	Source Category	PM2_5	NOX	VOC	NH3	SO2
2010 Baseline	**Salt Lake City NA**	Area Sources	5.87	17.71	51.53	17.96	0.88
		Mobile Sources	8.59	99.63	62.51	1.86	0.63
		NonRoad	1.27	23.04	9.50	0.01	0.66
		Point Source	3.89	20.14	6.48	0.64	10.64
		2010 Total	**19.62**	**160.51**	**130.02**	**20.47**	**12.81**
2014	**Salt Lake City NA**	Area Sources	4.74	18.18	37.33	17.68	0.89
		Mobile Sources	8.51	80.00	49.62	1.75	0.58
		NonRoad	1.02	19.70	10.05	0.01	0.56
		Point Source	4.31	22.52	7.93	0.87	8.83
		2014 Total	**18.58**	**140.41**	**104.93**	**20.31**	**10.86**
2017	**Salt Lake City NA**	Area Sources	4.66	16.97	36.02	17.57	0.89
		Mobile Sources	8.22	66.98	41.80	1.64	0.58
		NonRoad	0.82	17.13	7.55	0.01	0.25
		Point Source	4.68	23.12	8.22	0.90	9.45
		2017 Total	**18.38**	**124.20**	**93.60**	**20.12**	**11.18**
2019	**Salt Lake City NA**	Area Sources	4.49	17.76	37.09	17.15	0.90
		Mobile Sources	7.25	51.68	31.86	1.45	0.53
		NonRoad	0.82	17.28	7.10	0.01	0.62
		Point Source	4.76	24.02	8.32	0.92	8.85
		2019 Total	**17.33**	**110.74**	**84.37**	**19.52**	**10.91**

Year	NA-Area	Source Category	PM2_5	NOX	VOC	NH3	SO2
2010 Baseline	**Salt Lake City NA**	Area Sources	5.87	17.71	51.53	17.96	0.88
		Mobile Sources	8.59	99.63	62.51	1.86	0.63
		NonRoad	1.27	23.04	9.50	0.01	0.66
		Point Source	3.89	20.14	6.48	0.64	10.64
		2010 Total	**19.62**	**160.51**	**130.02**	**20.47**	**12.81**
2014	**Salt Lake City NA**	Area Sources	4.74	18.18	37.33	17.68	0.89
		Mobile Sources	8.51	80.00	49.62	1.75	0.58
		NonRoad	1.02	19.70	10.05	0.01	0.56
		Point Source	4.31	22.52	7.93	0.87	8.83
		2014 Total	**18.58**	**140.41**	**104.93**	**20.31**	**10.86**
2017	**Salt Lake City NA**	Area Sources	4.66	16.97	36.02	17.57	0.89
		Mobile Sources	8.22	66.98	41.80	1.64	0.58
		NonRoad	0.82	17.13	7.55	0.01	0.25
		Point Source	4.68	23.12	8.22	0.90	9.45
		2017 Total	**18.38**	**124.20**	**93.60**	**20.12**	**11.18**
2019	**Salt Lake City NA**	Area Sources	4.49	17.76	37.09	17.15	0.90
		Mobile Sources	7.25	51.68	31.86	1.45	0.53
		NonRoad	0.82	17.28	7.10	0.01	0.62
		Point Source	4.72	25.82	9.43	1.28	8.79
		2019 Total	**17.28**	**112.54**	**85.48**	**19.88**	**10.85**

Table 4.2, Emissions Summaries for the Salt Lake City, UT Nonattainment Area; Baseline, RFP and Attainment Years (SMOKE)

The 2010 Baseline and projections to 2014, 2017 and 2019 emissions estimates are calculated from the Sparse Matrix Operator Kernel Model (SMOKE). More detailed inventory information may be found in the Technical Support Document (TSD).

Chapter 5 – ATTAINMENT DEMONSTRATION

5.1 Introduction

UDAQ conducted a technical analysis to support the development of Utah's 24-hr $PM_{2.5}$ State Implementation Plan (SIP). The analyses include preparation of emissions inventories and meteorological data, and the evaluation and application of regional photochemical model. An analysis using observational datasets will be shown to detail the chemical regimes of Utah's Nonattainment areas.

5.2 Photochemical Modeling

Photochemical models are relied upon by federal and state regulatory agencies to support their planning efforts. Used properly, models can assist policy makers in deciding which control programs are most effective in improving air quality, and meeting specific goals and objectives.

The air quality analyses were conducted with the Community Multiscale Air Quality (CMAQ) Model version 4.7.1, with emissions and meteorology inputs generated using SMOKE and WRF, respectively. CMAQ was selected because it is the open source atmospheric chemistry model co-sponsored by EPA and the National Oceanic Atmospheric Administration (NOAA), thus approved by EPA for this plan.

5.3 Domain/Grid Resolution

UDAQ selected a high resolution 4-km modeling domain to cover all of northern Utah including the portion of southern Idaho extending north of Franklin County and west to the Nevada border (Figure 5.1). This 97 x 79 horizontal grid cell domain was selected to ensure that all of the major emissions sources that have the potential to impact the nonattainment areas were included. The vertical resolution in the air quality model consists of 17 layers extending up to 15 km, with higher resolution in the boundary layer.

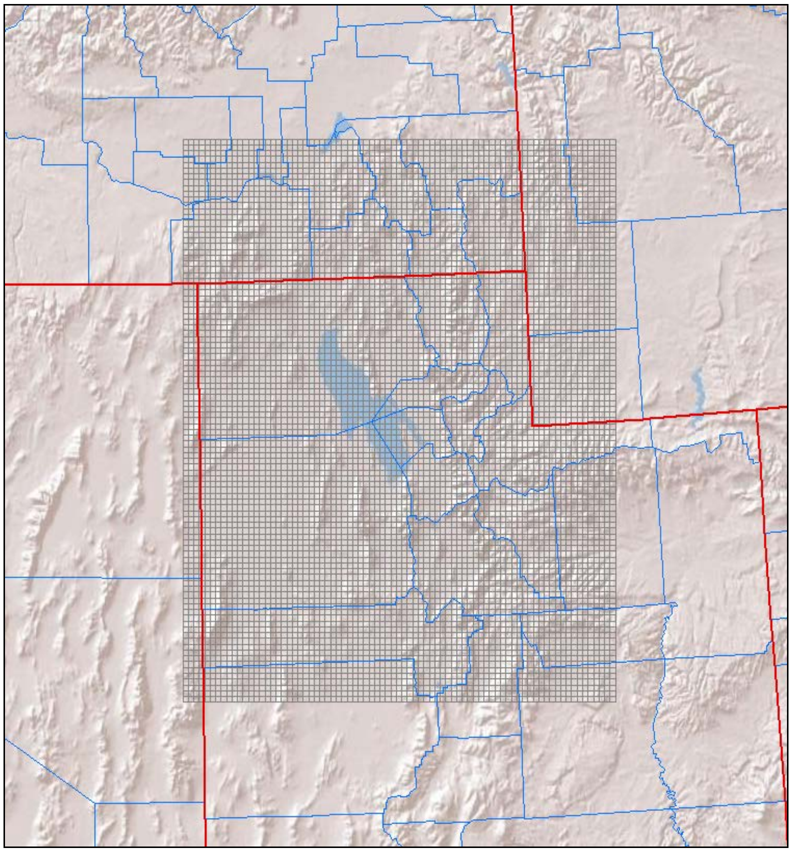

Figure 5.1: Northern Utah photochemical modeling domain.

5.4 Episode Selection

According to EPA's April 2007 "Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze" the selection of SIP episodes for modeling should consider the following 4 criteria:

1. Select episodes that represent a variety of meteorological conditions that lead to elevated $PM_{2.5}$.
2. Select episodes during which observed concentrations are close to the baseline design value.
3. Select episodes that have extensive air quality data bases.
4. Select enough episodes such that the model attainment test is based on multiple days at each monitor violating NAAQS.

In general, UDAQ wanted to select episodes with hourly $PM_{2.5}$ concentrations that are reflective of conditions that lead to 24-hour NAAQS exceedances. From a synoptic meteorology point of view, each selected episode features a similar pattern. The typical pattern includes a deep trough over the eastern United States with a building and eastward moving ridge over the western United States. The episodes typically begin as the ridge begins to build eastward, near surface winds weaken, and rapid stabilization due to warm advection and subsidence dominate. As the ridge centers over Utah and subsidence peaks, the atmosphere becomes extremely stable and a subsidence inversion descends towards the surface. During this time, weak insolation, light winds, and cold temperatures promote the development of a persistent cold air pool. Not until the ridge moves eastward or breaks down from north to south is there enough mixing in the atmosphere to completely erode the persistent cold air pool.

From the most recent 5-year period of 2007-2011, UDAQ developed a long list of candidate $PM_{2.5}$ wintertime episodes. Three episodes were selected. An episode was selected from January 2007, an episode from February 2008, and an episode during the winter of 2009-2010 that features multi-event episodes of $PM_{2.5}$ buildup and washout. Further detail of the episodes is below:

- **Episode 1: January 11-20, 2007**

A cold front passed through Utah during the early portion of the episode and brought very cold temperatures and several inches of fresh snow to the Wasatch Front. The trough was quickly followed by a ridge that built north into British Columbia and began expanding east into Utah. This ridge did not fully center itself over Utah, but the associated light winds, cold temperatures, fresh snow, and subsidence inversion produced very stagnant conditions along the Wasatch Front. High temperatures in Salt Lake City throughout the episode were in the high teens to mid-20's Fahrenheit.

Figure 5.2 shows hourly $PM_{2.5}$ concentrations from Utah's 4 $PM_{2.5}$ monitors for January 11-20, 2007. The first 6 to 8 days of this episode are suited for modeling. The episode becomes less suited after January 18 because of the complexities in the meteorological conditions leading to temporary $PM_{2.5}$ reductions.

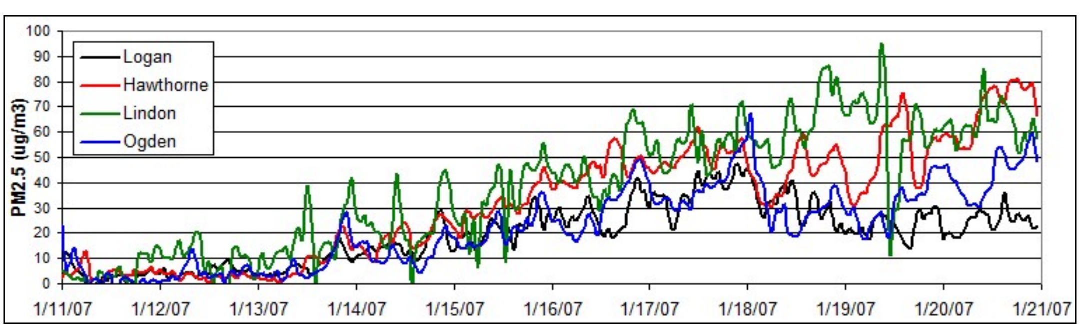

Figure 5.2: Hourly $PM_{2.5}$ concentrations for January 11-20, 2007

- **Episode 2: February 14-18, 2008**

The February 2008 episode features a cold front passage at the start of the episode that brought significant new snow to the Wasatch Front. A ridge began building eastward from the Pacific Coast and centered itself over Utah on Feb 20th. During this time a subsidence inversion lowered significantly from February 16 to February 19. Temperatures during this episode were mild with high temperatures at SLC in the upper 30's and lower 40's Fahrenheit.

The 24-hour average $PM_{2.5}$ exceedances observed during the proposed modeling period of February 14-19, 2008 were not exceptionally high. What makes this episode a good candidate for modeling are the high hourly values and smooth concentration build-up. The first 24-hour exceedances occurred on February 16 and were followed by a rapid increase in $PM_{2.5}$ through the first half of February 17 (Figure 5.3). During the second half of February 17, a subtle meteorological feature produced a mid-morning partial mix-out of particulate matter and forced 24-hour averages to fall. After February 18, the atmosphere began to stabilize again and resulted in even higher $PM_{2.5}$ concentrations during February 20, 21, and 22. Modeling the 14th through the 19th of this episode should successfully capture these dynamics. The smooth gradual build-up of hourly $PM_{2.5}$ is ideal for modeling.

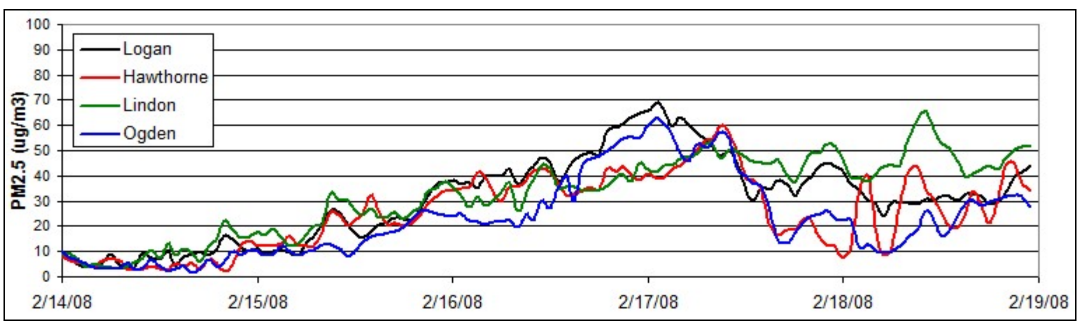

Figure 5.3: Hourly $PM_{2.5}$ concentrations for February 14-19, 2008

- **Episode 3: December 13, 2009 – January 18, 2010**

The third episode that was selected is more similar to a "season" than a single $PM_{2.5}$ episode (Figure 5.4). During the winter of 2009 and 2010, Utah was dominated by a semi-permanent ridge of high pressure that prevented strong storms from crossing Utah. This 35 day period was characterized by 4 to 5 individual $PM_{2.5}$ episodes each followed by a partial $PM_{2.5}$ mix out when a weak weather system passed through the ridge. The long length of the episode and repetitive $PM_{2.5}$ build-up and mix-out cycles makes it ideal for evaluating model strengths and weaknesses and $PM_{2.5}$ control strategies.

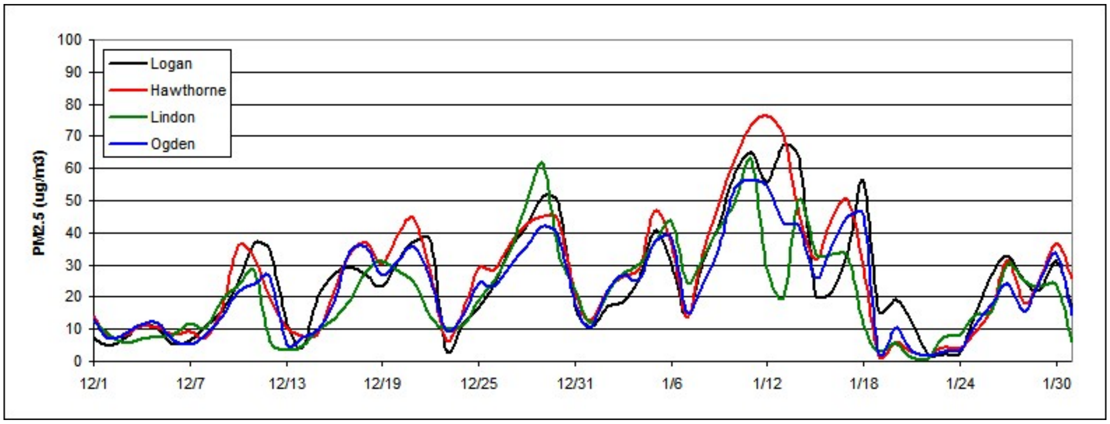

Figure 5.4: 24-hour average $PM_{2.5}$ concentrations for December-January, 2009-10.

5.5 Meteorological Data

Meteorological inputs were derived using the Weather Research and Forecasting (WRF), Advanced Research WRF (WRF-ARW) model version 3.2. WRF contains separate modules to compute different physical processes such as surface energy budgets and soil interactions, turbulence, cloud microphysics, and atmospheric radiation. Within WRF, the user has many options for selecting the different schemes for each type of physical process. There is also a WRF Preprocessing System (WPS) that generates the initial and boundary conditions used by WRF, based on topographic datasets, land use information, and larger-scale atmospheric and oceanic models.

Model performance of WRF was assessed against observations at sites maintained by the Utah Air Monitoring Center. A summary of the performance evaluation results for WRF are presented below:

- The biggest issue with meteorological performance is the existence of a warm bias in surface temperatures during high $PM_{2.5}$ episodes. This warm bias is a common trait of WRF modeling during Utah wintertime inversions.
- WRF does a good job of replicating the light wind speeds (< 5 mph) that occur during high $PM_{2.5}$ episodes.
- WRF is able to simulate the diurnal wind flows common during high $PM_{2.5}$ episodes. WRF captures the overnight downslope and daytime upslope wind flow that occurs in Utah valley basins.
- WRF has reasonable ability to replicate the vertical temperature structure of the boundary layer (i.e., the temperature inversion), although it is difficult for WRF to reproduce the inversion when the inversion is shallow and strong (i.e., an 8 degree temperature increase over 100 vertical meters).

5.6 Photochemical Model Performance Evaluation

The model performance evaluation focused on the magnitude, spatial pattern, and temporal variation of modeled and measured concentrations. This exercise was intended to assess whether, and to what degree, confidence in the model is warranted (and to assess whether model improvements are necessary).

CMAQ model performance was assessed with observed air quality datasets at UDAQ-maintained air monitoring sites (Figure 5.5). Measurements of observed $PM_{2.5}$ concentrations along with gaseous precursors of secondary particulate (e.g., NO_x, ozone) and carbon monoxide are made throughout winter at most of the locations in Figure 5.5. $PM_{2.5}$ speciation performance was assessed using the three Speciation Monitoring Network Sites (STN) located at the Hawthorne site in Salt Lake City, the Bountiful site in Davis County, and the Lindon site in Utah County.

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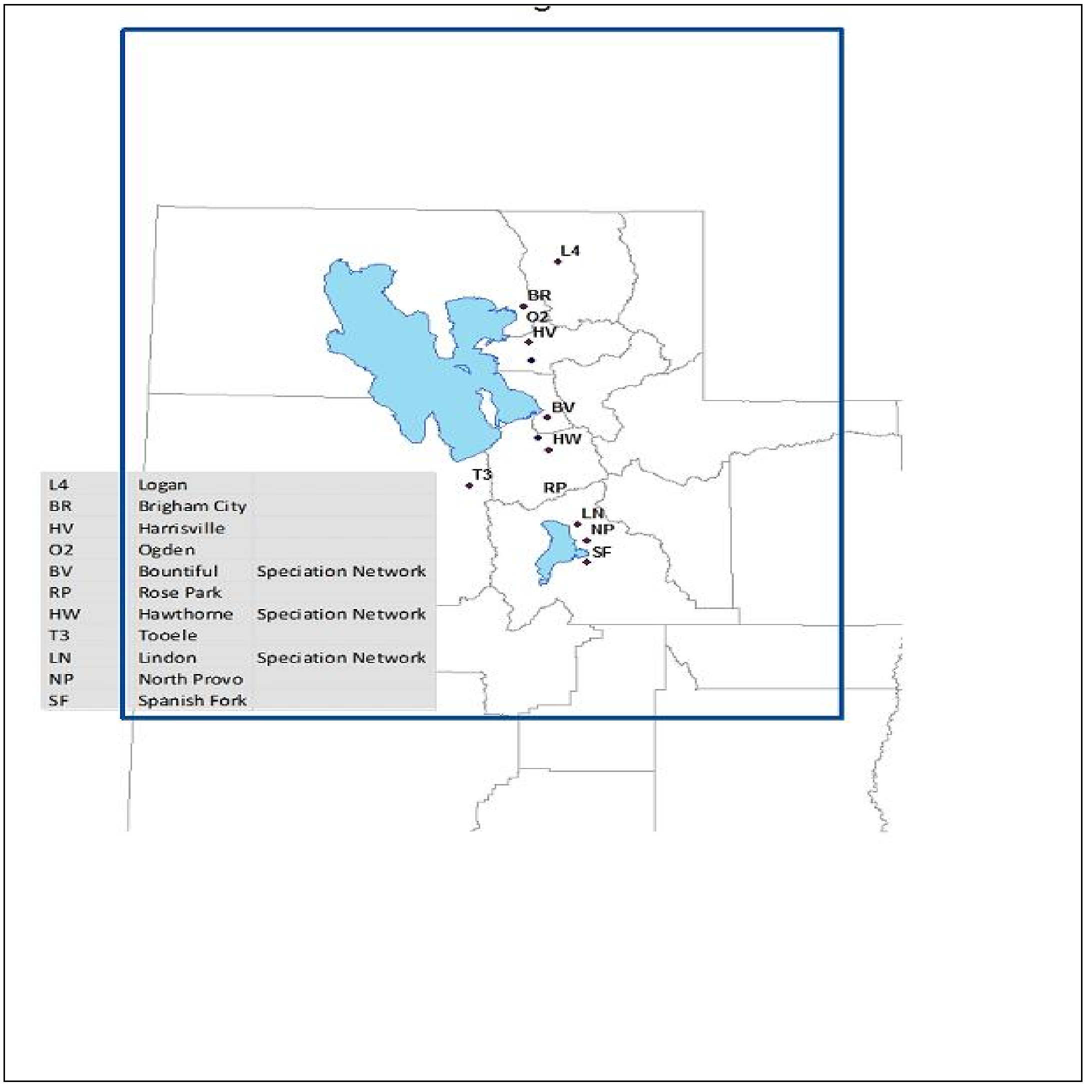

2 **Figure 5.5: UDAQ monitoring network and model domain extent.**

A spatial plot is provided for modeled 24-hr $PM_{2.5}$ for 2010 January 03 in Figure 5.6. The spatial plot shows the model does a reasonable job reproducing the high $PM_{2.5}$ values, and keeping those high values confined in the valley locations where emissions occur.

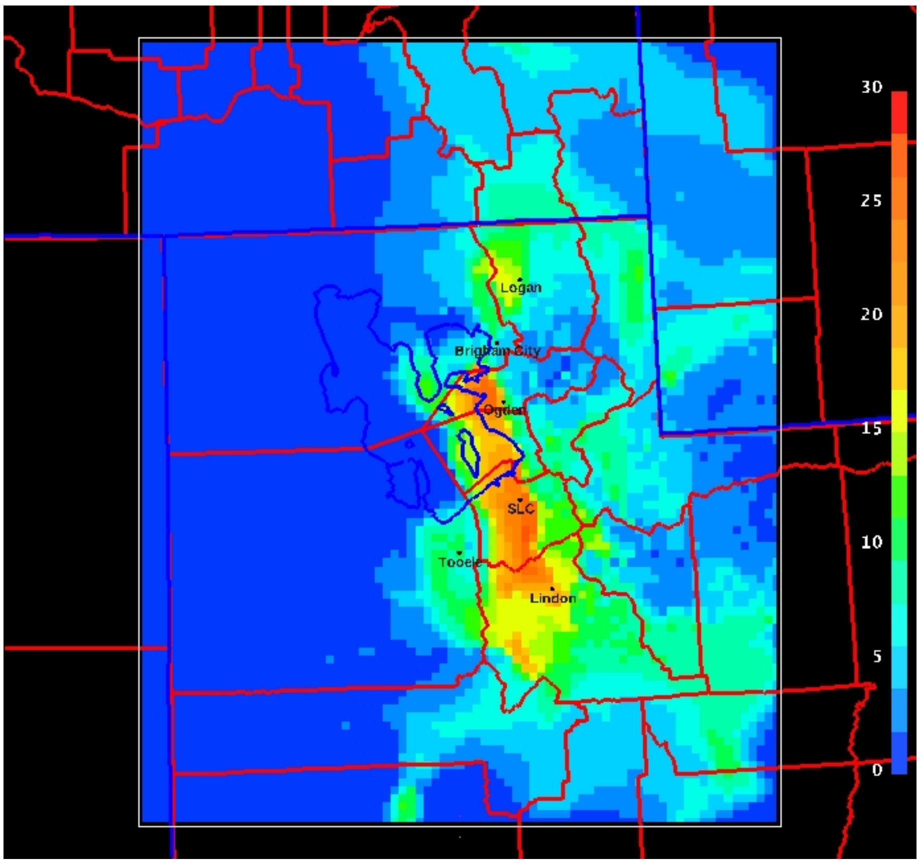

Figure 5.6: Spatial plot of CMAQ modeled 24-hr $PM_{2.5}$ ($\mu g/m^3$) for 2010 Jan. 03.

Time series of 24-hr $PM_{2.5}$ concentrations for the 13 Dec. 2009 – 15 Jan. 2010 modeling period are shown in Figs. 5.7 – 5.9 at the Hawthorne site in Salt Lake City (Fig. 5.7), the Ogden site in Weber County (Fig 5.8), and the Lindon site in Utah County (Fig. 5.9). For the most part, CMAQ replicates the buildup and washout of each individual episode. While CMAQ builds 24-hr $PM_{2.5}$ concentrations during the 08 Jan. – 14 Jan. 2010 episode, it was not able to produce the > 60 $\mu g/m^3$ concentrations observed at the monitoring locations.

It is often seen that CMAQ "washes" out the $PM_{2.5}$ episode a day or two earlier than that seen in the observations. For example, on the day 21 Dec. 2009, the concentration of $PM_{2.5}$ continues to build while CMAQ has already cleaned the valley basins of high $PM_{2.5}$ concentrations. At these times, the observed cold pool that holds the $PM_{2.5}$ is often very shallow and winds just above this cold pool are southerly and strong before the approaching cold front. This situation is very difficult for a meteorological and photochemical model to reproduce. An example of this situation is shown in Fig. 5.10, where the lowest part of the Salt Lake Valley is still under a very shallow stable cold pool, yet higher elevations of the valley have already been cleared of the high $PM_{2.5}$ concentrations.

During the 24 – 30 Dec. 2009 episode, a weak meteorological disturbance brushes through the northernmost portion of Utah. It is noticeable in the observations at the Ogden monitor at 25 Dec. as $PM_{2.5}$ concentrations drop on this day before resuming an increase through Dec. 30. The meteorological model and thus CMAQ correctly pick up this disturbance, but completely clears out the building $PM_{2.5}$; and thus performance suffers at the most northern Utah monitors (e.g. Ogden). The monitors to the south (Hawthorne, Lindon) are not influence by this disturbance and building of $PM_{2.5}$ is replicated by CMAQ. This highlights another challenge of modeling $PM_{2.5}$ episodes in Utah. Often during cold pool events, weak disturbances will pass through Utah that will de-stabilize the valley inversion and cause a partial clear out of $PM_{2.5}$. However, the $PM_{2.5}$ is not completely cleared out, and after the disturbance exits, the valley inversion strengthens and the $PM_{2.5}$ concentrations continue to build. Typically, CMAQ completely mixes out the valley inversion during these weak disturbances.

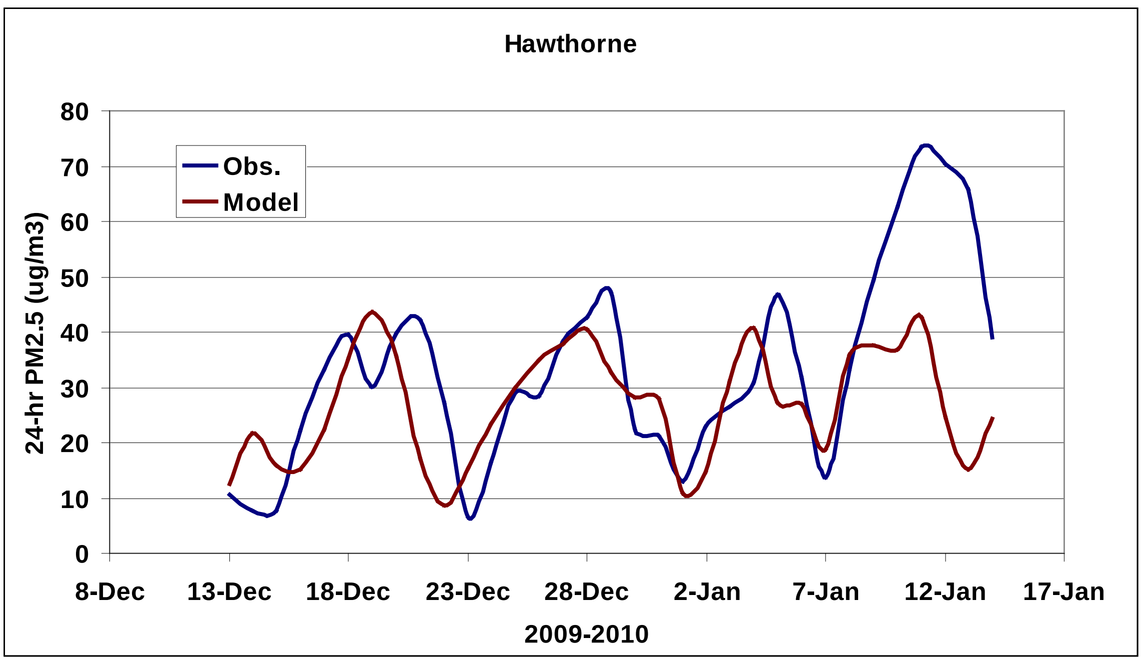

Figure 5.7: 24-hr $PM_{2.5}$ time series (Hawthorne). 24-hr PM2.5 time series. Observed 24-hr PM2.5 (blue trace) and CMAQ modeled 24-hr PM2.5 (red trace).

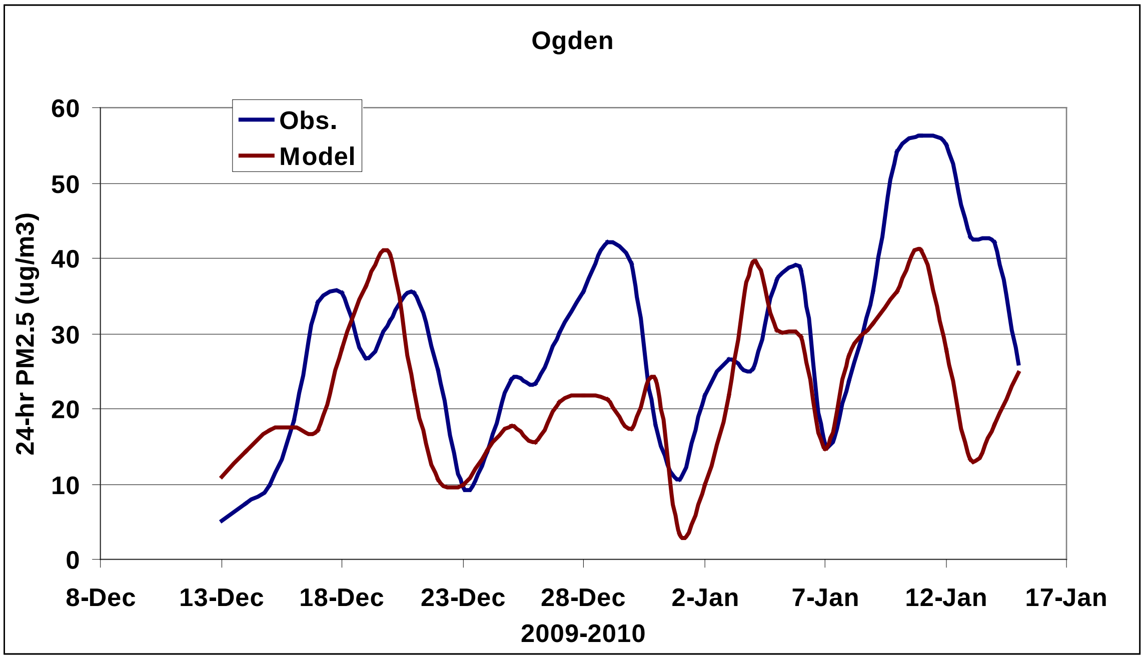

Figure 5.8: 24-hr $PM_{2.5}$ time series (Ogden). 24-hr PM2.5 time series. Observed 24-hr PM2.5 (blue trace) and CMAQ modeled 24-hr PM2.5 (red trace).

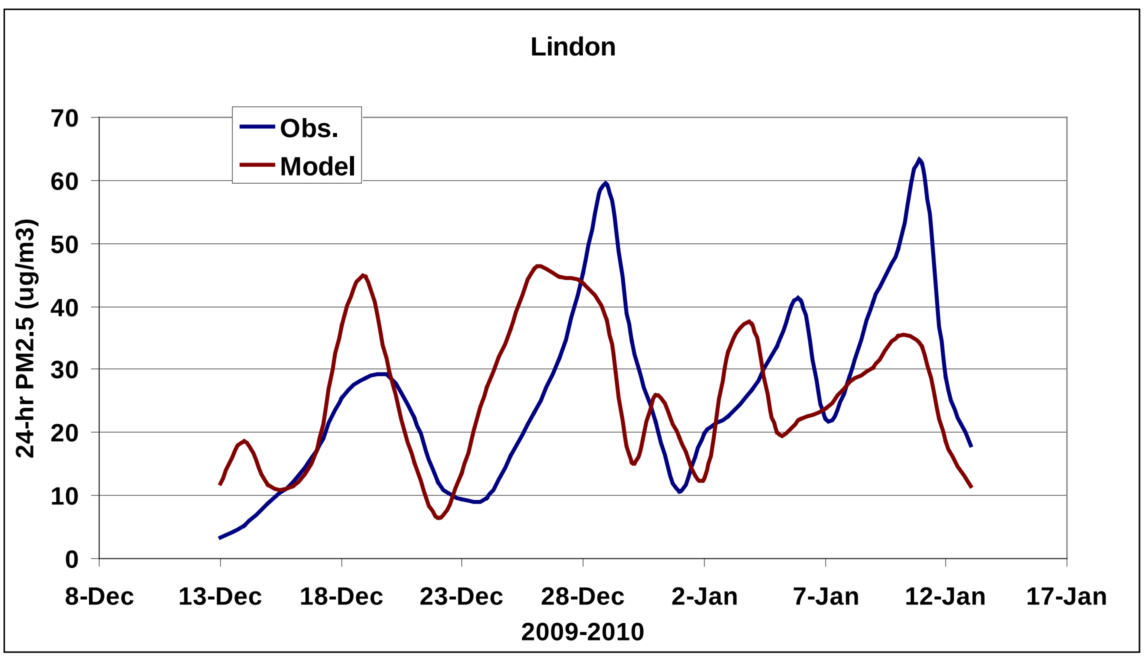

Figure 5.9: 24-hr $PM_{2.5}$ time series (Lindon). 24-hr PM2.5 time series. Observed 24-hr PM2.5 (blue trace) and CMAQ modeled 24-hr PM2.5 (red trace).

Figure 5.10: An example of the Salt Lake Valley at the end of a high $PM_{2.5}$ episode. The lowest elevations of the Salt Lake Valley are still experiencing an inversion and elevated $PM_{2.5}$ concentrations while the $PM_{2.5}$ has been 'cleared out' throughout the rest of the valley. These 'end of episode' clear out periods are difficult to replicate in the photochemical model.

Generally, the performance of CMAQ to replicate the buildup and clear out of $PM_{2.5}$ is good. However, it is important to verify that CMAQ is replicating the components of $PM_{2.5}$ concentrations. $PM_{2.5}$ simulated and observed speciation is shown at the 3 STN sites in Figures 5.11 – 5.13. The observed speciation is constructed using days in which the STN filter 24-hr $PM_{2.5}$ concentration was > 25 µg/m^3. For the 2009-2010 modeling period, the observed speciation pie charts were created using 10 filter days at Hawthorne, 9 days at Lindon, and 8 days at Bountiful. The speciation of this small dataset appears similar to a comparison of a larger dataset of STN filter speciated data from 2005-2010 for high wintertime $PM_{2.5}$ days (see Figure 3.2 for one of these at Hawthorne).

The simulated speciation is constructed using modeling days that produced 24-hr $PM_{2.5}$ concentrations > 25 µg/m^3. Using this criterion, the simulated speciation pie chart is created from 18 modeling days for Hawthorne, 16 days at Lindon, and 16 days at Bountiful. At all 3 STN sites, the percentage of simulated nitrate is over-predicted by 5 to 7%. The simulated ammonium percentage is nearly identical to the observed STN speciation. At the Hawthorne site, organic carbon looks to be under-predicted by CMAQ with a percentage of $PM_{2.5}$ at 12% and an observed organic carbon at 21%. This discrepancy in organic carbon is not apparent at the Bountiful and Lindon site.

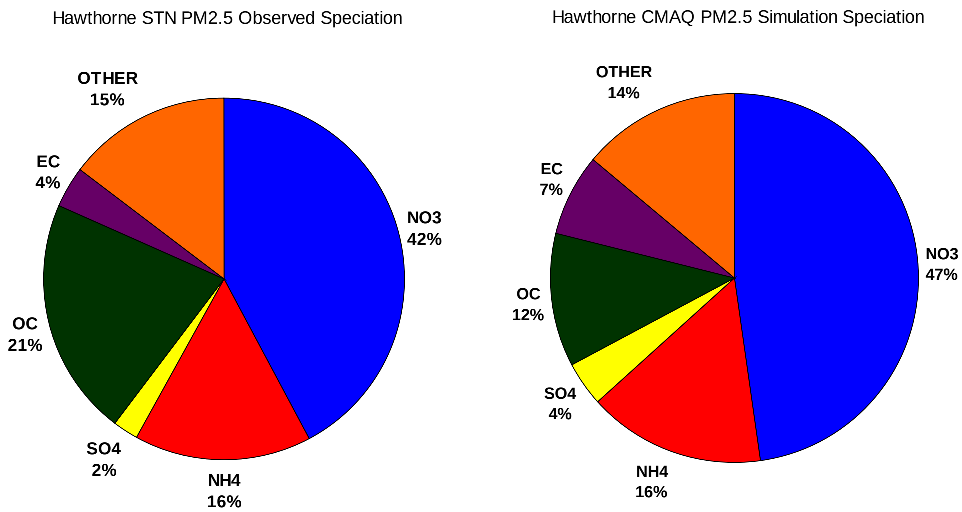

Figure 5.11: The composition of observed and model simulated average 24-hr $PM_{2.5}$ concentrations averaged over days when an observed and modeled day had 24-hr concentrations > 25 µg/m^3 at the Hawthorne STN site.

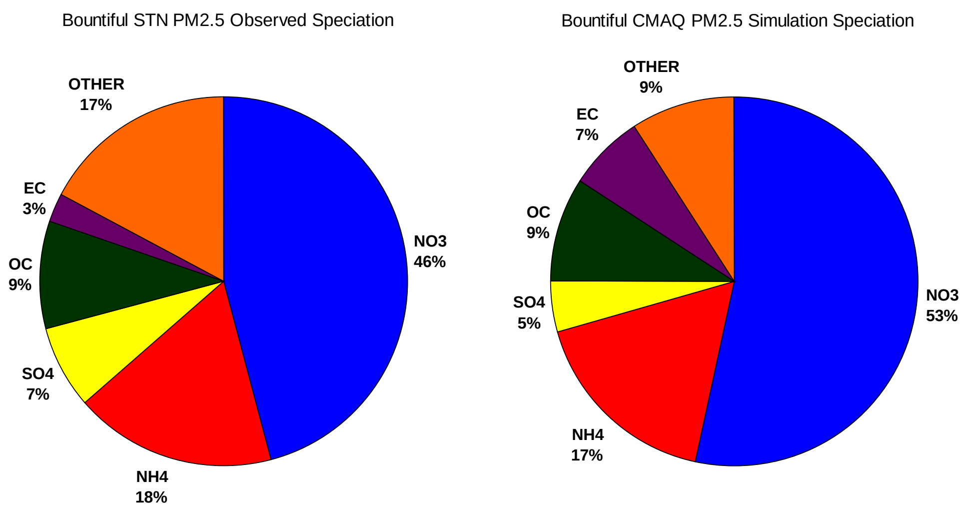

Figure 5.12: The composition of observed and model simulated average 24-hr $PM_{2.5}$ concentrations averaged over days when an observed and modeled day had 24-hr concentrations > 25 µg/m^3 at the Bountiful STN site.

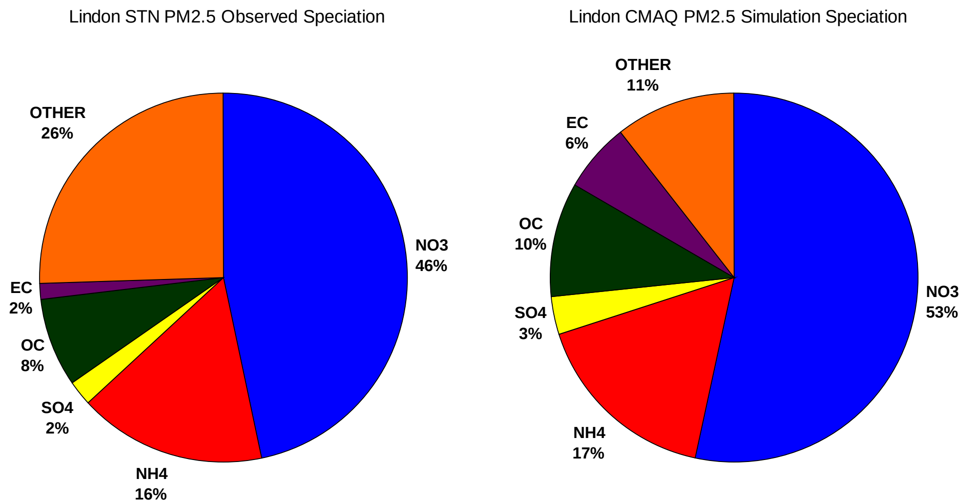

Figure 5.13: The composition of observed and model simulated average 24-hr $PM_{2.5}$ concentrations averaged over days when an observed and modeled day had 24-hr concentrations > 25 µg/m^3 at the Lindon STN site.

5.7 Summary of Model Performance

Model performance for 24-hr $PM_{2.5}$ is good and generally acceptable and can be characterized as follows:

- Good replication of the episodic buildup and clear out of $PM_{2.5}$. Often the model will clear out the simulated $PM_{2.5}$ a day too early at the end of an episode. This clear out time period is difficult to model (i.e., Figure 1.11).
- Good agreement in the magnitude of $PM_{2.5}$, as the model can consistently produce the high concentrations of $PM_{2.5}$ that coincide with observed high concentrations.
- Spatial patterns of modeled 24-hr $PM_{2.5}$, show for the most part, that the $PM_{2.5}$ is being confined in the valley basins, consistent to what is observed.
- Speciation and composition of the modeled $PM_{2.5}$ matches the observed speciation quite well. Modeled and observed nitrate are between 40% and 50% of the $PM_{2.5}$. Ammonium is between 15% and 20% for both modeled and observed $PM_{2.5}$. Organic carbon is underestimated at the Hawthorne location, but is reasonably estimated at the other locations (Bountiful, Lindon).

Several observations should be noted on the implications of these model performance findings on the attainment modeling presented in the following section. First, it has been demonstrated that model performance overall is acceptable and, thus, the model can be used for air quality planning purposes. Second, consistent with EPA guidance, the model is used in a relative sense to project future year values. EPA suggests that this approach "should reduce some of the uncertainty attendant with using absolute model predictions alone." Furthermore, the attainment modeling is supplemented by additional information to provide a weight of evidence determination.

5.8 Modeled Attainment Test

UDAQ will use Model Attainment Test Software (MATS) for the modeled attainment test at grid cells near monitors. MATS is designed to interpolate the species fractions of the PM mass from the Speciation Trends Network (STN) monitors to the FRM monitors. The model also calculates the relative response factor (RRF) for grid cells near each monitor and uses these to calculate a future year design value for these cells.

MATS results for future year modeling is presented in Figure 5.16. The future year design values are presented with and without SIP controls for 2014, 2017, and 2019 (the attainment year). For comparison purposes, the monitored design value is also presented for the base year, 2010.

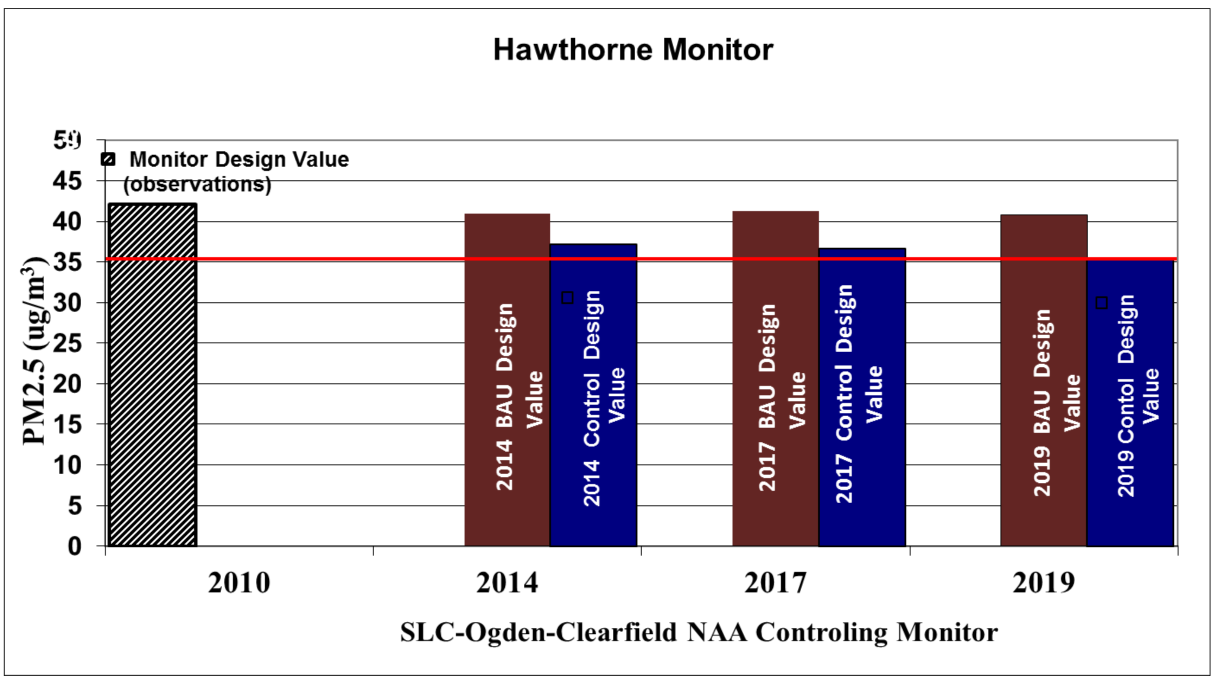

Figure 5.16, Model Results for the Salt Lake City, UT Nonattainment Area

Table 5.3 presents the same information in tabular form, and also includes any additional monitoring locations in the nonattainment area.

	2010	2014		2017		2019	
	Observed	Business-As-Usual	Control Basket	Business-As-Usual	Control Basket	Business-As-Usual	Control Basket
Bountiful	*37*	*34*	*32*	*34*	*32*	*34*	*31*
Brigham City	*40*	*35*	*31*	*35*	*31*	*34*	*30*
Harrisville	*35*	*33*	*30*	*33*	*30*	*33*	*29*
Hawthorne	*42*	*41*	*37*	*41*	*37*	*41*	*35*
Magna	*32*	*31*	*28*	*31*	*27*	*31*	*27*
Ogden 2	*38*	*36*	*34*	*36*	*33*	*36*	*32*
Rose Park	*39*	*39*	*34*	*39*	*34*	*39*	*33*
Tooele	*25*	*23*	*20*	*23*	*19*	*23*	*19*

Table 5.3, Modeled Concentrations (µg/m^3) for the Salt Lake City, UT Nonattainment Area

The "Control Basket" inventory that is presented in Table 5.3 consists of a combination of SIP reductions on point sources and new rules to be implemented that will affect smaller commercial and industrial businesses. All of these changes are detailed in Chapter 6 - Control Measures. Summary tables of the emission inventories that result from the Control Basket reductions are available in the TSD: Section 3 Baseline and Control Strategies.

5.9 Attainment Date

As shown in the modeled attainment test, the emissions reductions achievable in 2014 do not allow for a demonstration that the Salt Lake City, UT nonattainment area can attain the 24-hour $PM_{2.5}$ NAAQS. Rather, additional reductions will be necessary in the time period between 2014 and 2019 in order to attain. Therefore, this plan identifies an attainment date of December 14, 2019, and requests that the Administrator extend the attainment date the full 5 years permissible under Section 172(a)(2) of the Act.

Chapter 6 – CONTROL MEASURES

6.1 Introduction

Attaining the 24-hour NAAQS for $PM_{2.5}$ will require emission controls from directly emitted $PM_{2.5}$ as well as $PM_{2.5}$ plan precursors (SO_2, NO_x and VOC). It will involve emission sources from each of the four sectors identified in the discussion on emission inventories (stationary point sources, area sources, on-road mobile sources and off-road mobile sources). Furthermore, it will entail control measures of two basic types: existing measures; and measures imposed through this SIP.

This chapter summarizes the overall control strategy for the plan. Additional detail concerning individual emission control measures, including the emissions reductions to be expected, is contained in the Technical Support Document.

6.2 Utah Stakeholder Workgroup Efforts

In response to increasing interest in Utah's air quality problems and the need for greater participation in reducing air emissions, the Utah Division of Air Quality (DAQ) created a significant and meaningful role for public participation in the $PM_{2.5}$ SIP development process. The public involvement process was driven by a need for transparency and inclusivity of public health and business interests impacted by air quality issues.

DAQ's measures of success for the public involvement process were:

- Buy-in from public, stakeholders, and elected officials,
- SIP recommendations that are championed and implemented, and ;
- Close working relationship with partner organizations to deliver a unified message.

Measures of success for participants were:

- Having a say in plans that impacted their communities,
- Access to information and time to understand issues and provide input,
- Access to DAQ staff and the SIP development process,
- Meaningful participation in the process, and;
- Transparency of the process.

Public participation centered on creating workgroups with members from each county within the $PM_{2.5}$ nonattainment area—Box Elder, Cache, Davis, Salt Lake, Tooele, Utah, and Weber. More than 100 people from agriculture, academia, environmental groups, state and local elected officials, industry, and the public volunteered to participate. Their participation ensured that the SIP development process would have grassroots-level input about strategies and their impacts on a countywide level.

Workgroup members were engaged in four rounds of meetings created to provide and gather information. After providing a baseline level of knowledge during Meeting One, draft emissions reductions were discussed during Meetings Two and Three, each followed by a survey to capture new ideas and feedback. Responses from the survey, and other feedback received during the process, were used to refine emissions inventories, in some cases significantly, refine mitigation strategies, provide new strategies, and provide ideas for implementation. Meeting Four was an opportunity for workgroup members to introduce the SIP package to the public and talk about the development process before one of several public comment hearings held in the nonattainment counties.

The public participation process was not without challenges. One of the most difficult was providing information that could get a diverse group of stakeholders to understand very complex and technical air quality and emissions reductions issues. Despite the challenges, the process was successful and contributed to a well-rounded and well-vetted SIP package.

6.3 Identification of Measures

In considering the suite of control measures that could be implemented as part of this plan several important principles were applied to expedite the analysis.

Filter data shows that secondary particulate is the portion of mass most responsible for exceedances of the standard on episode days, and specifically shows that ammonium nitrate is the single largest component of that material. In addition, it shows that organic carbon represents the bulk of primary $PM_{2.5}$.

Priority was given to those source categories or pollutants responsible for relatively larger percentages of the emissions leading to exceedances of the $PM_{2.5}$ NAAQS. The emissions inventory compiled to represent base-year conditions was useful in identifying the contributors to these emissions, particularly in their relation to the formation of ammonium nitrate.

At the same time, the air quality modeling shed light on the sensitivity of the airshed in its response to changes in different pollutants. VOC was immediately identified as a significant contributor to elevated $PM_{2.5}$ concentrations, and proved to be more limiting in the overall atmospheric chemistry than NO_x. This pointed the search for viable control strategies toward VOC emissions, and somewhat away from NO_x. It also became apparent that directly emitted $PM_{2.5}$, while a relatively small portion of the overall filter mass, is independent of the non-linear chemical transformation to particulate matter. Therefore, any reduction in $PM_{2.5}$ emissions will directly improve future $PM_{2.5}$ concentrations, and like VOC, made these emissions an attractive target for potential control measures. Subsequent modeling revealed that, as time progressed and the relative concentrations of NO_x and VOC changed, controlling for NO_x would yield more benefit in terms of controlling $PM_{2.5}$.

6.4 Existing Control Measures

The idea of controlling emissions to the airshed is not a new one. Since about 1970 there have been regulations at both the state and federal level to mitigate air contaminants. It follows that the estimates of emissions used in modeled attainment demonstration for this Plan take into account the effectiveness of existing control measures. These measures affect not only the levels of current emissions, but some continue to affect emissions trends as well.

An example of the former would be the effectiveness of an add-on control device at a stationary point source. It is presently effective in controlling emissions, and will continue to be that effective five years from now.

An example of the latter would be a federal rule that affects the manufacture of engines. The engines already sold into the airshed are effective in reducing emissions, but the number of these engines replacing older, higher emitting engines is increasing. Therefore, a rule such as this also affects the trend of emissions for that source category in a positive way.

The effectiveness of any control measure that was in place, and enforceable, at the time this Plan was written has been accounted for in the tabulation of baseline emissions and projected emissions. Other controls that are anticipated but not yet in place do not factor into the attainment demonstration underlying this Plan.

The following paragraphs discuss some of the more important control strategies that are already in place for the four basic sectors of the emissions inventory.

Stationary Point Sources:

Utah's permitting rules require a review of new and modified major stationary sources in nonattainment areas, as is required by Section 173 of the Clean Air Act. Beyond that however, even minor sources and minor modifications to major sources, planning to locate anywhere in the state, are required to undergo a new source review analysis and receive an approval order to construct. Part of this review is an analysis to ensure the application of Best Available Control Technology (BACT). This requirement is ongoing and ensures that Utah's industry is well controlled.

Along the central Wasatch Front, stationary sources were required to reduce emissions at several junctures to address nonattainment issues with SO_2, ozone and PM_{10}.

SIPs for ozone and SO_2 in 1981 affected all of the precursors to secondary particulate. There were SO_2 reductions at the copper smelter and VOC reductions at the refineries. In addition, Control Techniques

Guideline documents (CTGs) affecting VOC emissions at a variety of industrial source categories were incorporated into Utah's air quality rules.

In the early 1990s, stationary sources were required to reduce PM_{10}, SO_2, and NO_x to address wintertime PM_{10} nonattainment.

Any of the source-specific emission controls or operating practices that has been required as a result of the forgoing has been reflected in the baseline emissions calculated for the large stationary sources, and therefore evaluated in the modeled attainment demonstration.

Area sources:

Stage 1 vapor control was introduced in Salt Lake and Davis Counties as part of the 1981 ozone SIP. This is a method of collecting VOC vapors, as underground gasoline storage tanks are filled at gas stations, and returning those vapors to a facility where they are collected and recycled. Since that time it has been extended to include the entire state.

Part of the PM_{10} control for Salt Lake and Davis Counties in the early 1990s was a program to curtail woodsmoke emissions during periods of atmospheric stagnation. Woodsmoke is rich in VOC emissions in addition to the particulate matter which is almost entirely within the $PM_{2.5}$ size fraction. In 2006 the woodburning program was extended to include the western half of Weber County as well.

CTGs adopted into Utah's air quality rules to control VOC emissions in Salt Lake and Davis Counties, as part of the 1981 ozone SIP, are also effective in controlling emissions from area sources.

Energy Efficiency

EPA recognizes the benefits of including energy efficiency programs in SIP's as a low cost means of reducing emissions. Two established energy efficiency programs that result in direct emission reductions within the Wasatch Front are already in place.

Questar Gas ThermWise Rebate Programs

Questar started the ThermWise Rebate Programs on January 1, 2007 as a way to promote the use of energy-efficient appliances and practices among its customers. The ThermWise Programs offer rebates to help offset the initial cost of energy-efficient appliances and weatherization. There are also rebates available for energy efficient new construction. The cost of rebates is built into the Questar gas rate. The rebates are vetted by the Utah Public Service Commission's strict "cost-effectiveness" tests. To pass these tests, Questar must prove that the energy cost savings produced by the ThermWise Programs exceeds the cost of the rebates. There is no scheduled end to the ThermWise Programs. According to the Questar program information, the program will remain in place as long as rebates remain cost-effective.

UDAQ calculates area source emissions for natural gas by multiplying emission factors against actual and projected year gas usage data submitted by Questar. In this way, actual realized program reductions are expressed in the past year (baseline) emission inventory. Future investment in energy efficiency is not captured in our projected future gas usage. Continuance of this program will result in future gas emissions that are lower than projected.

Weatherization Assistance Program

The Weatherization Assistance Program helps low-income individuals and families reduce energy costs. Individuals, families, the elderly and the disabled who are making no more than 200 percent of the current federal poverty income level are eligible for help. However, priority is given to the elderly and disabled, households with high-energy consumption, emergency situations and homes with preschool-age children.

The Utah Division of Housing and Community Development administer the program statewide through eight government and nonprofit agencies. Benefits are provided in the form of noncash grants to eligible households to make energy-efficiency improvements to those homes.

The energy efficiency realized from this program is also imbedded within the gas usage data UDAQ receives from Questar.

On-road mobile sources:

The federal motor vehicle control program has been one of the most significant control strategies affecting emissions that lead to $PM_{2.5}$. Since 1968, the program has required newer vehicles to meet ever more stringent emission standards for CO, NO_x, and VOC. Tier 1 standards were established in the early 1990s and were fully implemented by 1997. The Tier 1 emission standards can be found in Table 6.1. The EPA created a voluntary clean car program on January 7, 1998 (63 FR January 7, 1998), which was called the National Low Emission Vehicle (NLEV) program. This program asked auto manufacturers to commit to meet tailpipe standards for light duty vehicles that were more stringent than Tier 1 standards.

EPA Tier 1 Emission Standards for Passenger Cars and Light-Duty Trucks, FTP 75, g/mi

Category	100,000 miles/10 years[1]					
	THC	**NMHC**	**CO**	**NO_x[2] diesel**	***NO_x gasoline***	**PM[3]**
Passenger cars	-	0.31	4.2	1.25	*0.6*	0.1
LLDT, LVW <3,750 lbs	0.8	0.31	4.2	1.25	*0.6*	0.1
LLDT, LVW >3,750 lbs	0.8	0.4	5.5	0.97	*0.97*	0.1
HLDT, ALVW <5,750 lbs	0.8	0.46	6.4	0.98	*0.98*	0.1
HLDT, ALVW > 5,750 lbs	0.8	0.56	7.3	1.53	*1.53*	0.12

1 - Useful life 120,000 miles/11 years for all HLDT standards and for THC standards for LDT

2 - More relaxed NO_x limits for diesels applicable to vehicles through 2003 model year

3 - PM standards applicable to diesel vehicles only

Abbreviations:

LVW - loaded vehicle weight (curb weight + 300 lbs)

ALVW - adjusted LVW (the numerical average of the curb weight and the GVWR)

LLDT - light light-duty truck (below 6,000 lbs GVWR)

HLDT - heavy light-duty truck (above 6,000 lbs GVWR)

Table 6.1, Tier 1 Emission Standards

Shortly thereafter, EPA promulgated the Tier 2 program. This program went into effect on April 10, 2000 (65 FR 6698 February 10, 2000) and was phased in between 2004 and 2008. Tier 2 introduced more stringent numerical emission limits compared to the previous program (Tier 1). Tier 2 set a single set of standards for all light duty vehicles. The Tier 2 emission standards are structured into 8 permanent and 3 temporary certification levels of different stringency, called "certification bins," and an average fleet standard for NO_x emissions. Vehicle manufacturers have a choice to certify particular vehicles to any of the available bins. The program also required refiners to reduce gasoline sulfur levels nationwide, which was fully implemented in 2007. The sulfur levels need to be reduced so that Tier 2 vehicles could run correctly and maintain their effectiveness. The EPA estimated that the Tier 2 program will reduce oxides of nitrogen emissions by at least 2,220,000 tons per year nationwide in 2020[1]. Tier 2 has also contributed in reducing VOC and direct PM emissions from light duty vehicles. Tier 2 standards are summarized in Table 6.2 below.

Tier 2 Emission Standards, FTP 75, g/mi

Bin#	Full Useful Life				
	NMOG*	**CO**	**NO_x†**	**PM**	**HCHO**
Temporary Bins					
11 MDPV[c]	0.28	7.3	0.9	0.12	0.032
10[a,b,d]	0.156 (0.230)	4.2 (6.4)	0.6	0.08	0.018 (0.027)
9[a,b,e]	0.090 (0.180)	4.2	0.3	0.06	0.018
Permanent Bins					
8[b]	0.125 (0.156)	4.2	0.2	0.02	0.018
7	0.09	4.2	0.15	0.02	0.018
6	0.09	4.2	0.1	0.01	0.018
5	0.09	4.2	0.07	0.01	0.018
4	0.07	2.1	0.04	0.01	0.011
3	0.055	2.1	0.03	0.01	0.011
2	0.01	2.1	0.02	0.01	0.004
1	0	0	0	0	0

* for diesel fueled vehicle, NMOG (non-methane organic gases) means NMHC (non-methane hydrocarbons)

† average manufacturer fleet NO_x standard is 0.07 g/mi for Tier 2 vehicles

[1] 65 FR 6698 February 10, 2000

a - Bin deleted at end of 2006 model year (2008 for HLDTs)

b - The higher temporary NMOG, CO and HCHO values apply only to HLDTs and MDPVs and expire after 2008

c - An additional temporary bin restricted to MDPVs, expires after model year 2008

d - Optional temporary NMOG standard of 0.280 g/mi (full useful life) applies for qualifying LDT4s and MDPVs only

e - Optional temporary NMOG standard of 0.130 g/mi (full useful life) applies for qualifying LDT2s only

Abbreviations:

LDT2 – light duty trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs. LVW)

LDT4 – light duty trucks 4 (6,001-8,500 lbs. GVWR, 5,751 lbs. and greater ALVW)

MDPV – medium duty passenger vehicle

HLDT - heavy light duty truck (above 6,000 lbs GVWR)

Table 6.2, Tier 2 Emission Standards

In addition to the benefits from Tier 2 in the current emissions inventories, the emission projections for this SIP from 2014 through 2019 (and beyond) continue to reflect significant improvements in both VOC and NO_x as older vehicles are replaced with Tier 2 vehicles. This trend may be seen in the inventory projections for on-road mobile sources despite the growth in vehicles and vehicle miles traveled that are factored into the same projections.

Additional on-road mobile source emissions improvement stemmed from federal regulations for heavy-duty diesel vehicles. The Highway Diesel Rule, which aimed at reducing pollution from heavy-duty diesel highway vehicles, was finalized in January 2001. Under the rule, beginning in 2007 (with a phase-in through 2010) heavy-duty diesel highway vehicle emissions were required to be reduced by as much 90 percent with a goal of complete fleet replacement by 2030. In order to enable the updated emission-reduction technologies necessitated by the rule, beginning in 2006 (with a phase-in through 2009) refiners were required to begin producing cleaner-burning ultra-low sulfur diesel fuel. Specifically, the rule required a 97 percent reduction in sulfur content from 500 parts per million (ppm) to 15 ppm. The overall nationwide effect of the rule is estimated to be equivalent to removing the pollution from over 90 percent of trucks and buses when the fleet turnover is completed in 2030.

To supplement the federal motor vehicle control program, Inspection / Maintenance (I/M) Programs were implemented in Salt Lake and Davis Counties in 1984. A program for Weber County was added in 1990. These programs have been effective in identifying vehicles that no longer meet the emission specifications for their respective makes and models, and in ensuring that those vehicles are repaired in a timely manner.

Off-road mobile sources:

Several significant regulatory programs enacted at the federal level will affect emissions from non-road mobile emission sources. This category of emitters includes airplanes, locomotives, hand-held engines, and larger portable engines such as generators and construction equipment. The effectiveness of these controls has been incorporated into the “NONROAD” model UDAQ uses to compile the inventory information for this source category. Thus, the controls have been factored into the projection inventories used in the modeled attainment demonstration.

EPA rules for non-road equipment and vehicles are grouped into various "tiers" in a manner similar to the tiers established for on-road motor vehicles. To date, non-road rules have been promulgated for Tiers 0 through IV, where the oldest equipment group is designated "Tier 0" and the newest equipment, some of which has yet to be manufactured, falls into "Tier IV."

Of note are the following:

Locomotives

Locomotive engine regulation began with Tier 0 standards promulgated in 1998, which apply to model year 2001 engines.

In addition, because of the very long lifetimes of these engines, often up to forty years, Tier 0 standards include remanufacturing standards, which apply to locomotive engines of model years 1973 through 2001.

Subsequent tier standards for line-haul locomotives apply as follows:

Tier	Applicable Model Years
Tier I	2002 - 2004
Tier II	2005 - 2011
Tier III	2012 - 2014
Tier IV	2015 - newer

Yard or "switch" locomotives are regulated under different standards than line-haul locomotives.

Lastly, EPA has promulgated remanufacturing standards for Tier I and 2 locomotive engines to date.

Large Engines

Large non-road engines are usually diesel-powered but include some gasoline-powered equipment.

Large land-based diesel equipment (> 37 kw or 50 hp) used in agricultural, construction and industrial applications are regulated under Tier I rules, which apply to model years 1996 through 2000. Subsequent Tier II through IV rules apply to newer model-year equipment.

Some large non-road engines are gasoline-powered (spark-ignition). These include equipment such as forklifts, some airport ground support equipment, recreational equipment such as ATVs, motorcycles and snowmobiles. These are regulated under various tiers in a manner similar to diesel equipment.

Small Engines

Small engines are generally gasoline-powered (spark-ignition). Equipment includes handheld and larger non-handheld types. Handheld equipment includes lawn and garden power tools such as shrub trimmers, saws and dust blowers. Non-handheld equipment includes equipment such as lawnmowers and lawn tractors. From an emissions standpoint, smaller engine size is offset by the large number of pieces of equipment in use by households and commercial establishments. This equipment is regulated under a tiered structure as well.

Emissions Benefit

Each major revision of the non-road tier standards results in a large reduction of carbon monoxide, hydrocarbons, nitrogen oxides and particulate matter.

For example, the Non-road Diesel Tier II and III Rule, which regulates model-year 2001 through 2008 diesel equipment (> 37 kw or 50 hp) is estimated by EPA, in its Regulatory Announcement for this rule dated August 1998, to decrease NO_x emissions by a million tons per year by 2010, the equivalent of taking 35 million passenger cars off the road.

EPA further estimates, in its Regulatory Announcement dated May 2004, that the Tier IV non-road diesel rule is expected to decrease exhaust emissions per piece of equipment by over 90 percent compared to older equipment.

Low-Sulfur Diesel

Non-road diesel equipment is required to operate on diesel fuel with a sulfur content of no greater than 500 ppm beginning June 1, 2007.

Beginning June 1, 2010, non-road diesel equipment must operate on "ultra-low" sulfur diesel with a sulfur content of no more than 15 ppm.

Locomotives and certain marine engines must operate on ultra-low sulfur diesel by June 1, 2012.

6.5 SIP Controls

Beyond the benefits attributable to the controls already in place, there are new controls identified by this SIP that provide additional benefit toward reaching attainment. A summary of the plan strategy is presented here for each of the emission source sectors.

Overall, within the Salt Lake City – UT nonattainment area, the strategy to reduce emissions results in 22.3 tons per day of combined $PM_{2.5}$, SO_2, NO_x and VOC in 2014, 43.1 tons per day in 2017, and 64.5 tons per day in 2019.

6.6 Reasonably Available Control Measures (RACM/RACT)

Section 172 of the CAA requires that each attainment plan "provide for the implementation of all reasonably available control measures (RACM) as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology (RACT)), and shall provide for attainment of the NAAQS."

EPA has interpreted these requirements in the April 25, 2007 Clean Air Fine Particulate Implementation Rule, at 72 FR 20586-20667, and supplemental guidance issued March 2, 2012 (memorandum from Stephen D. Page to Regional Air Directors).

EPA interprets RACM as referring to measures of any type that may be applicable to a wide range of sources (mobile, area, or stationary), whereas RACT refers to measures applicable to stationary sources. Thus, RACT is a type of RACM specifically designed for stationary sources. For both RACT and RACM, potential control measures must be shown to be both technologically and economically feasible.

Pollutants to be addressed by States in establishing RACT and RACM limits in their $PM_{2.5}$ attainment plans will include primary $PM_{2.5}$ as well as any pollutant identified in the plan as a significant contributor to $PM_{2.5}$ formation. For this plan, those pollutants include SO_2, NO_x and VOC.

In general, the combined approach to RACT and RACM includes the following steps: 1) identification of potential measures that are reasonable, 2) modeling to identify the attainment date that is as expeditious as practicable, and 3) selection of RACT and RACM.

EPA's final rule requires States to conduct an analysis to identify RACT for all affected stationary sources. States can thereafter determine that RACT does not include controls that would not otherwise be necessary to meet Reasonable Further Progress (RFP) requirements or to attain the NAAQS as expeditiously as practicable. Any measures that, collectively, would not advance attainment by at least one year are not required for $PM_{2.5}$ RACT/RACM, even if those measures are individually reasonable. RACT may vary in different nonattainment areas based on the reductions needed for attainment as expeditiously as practicable.

Implementation of RACT measures should be as expeditiously as practicable, but in no case should it start later than the beginning of the year before the nominal attainment date. Furthermore, if the attainment date has been extended, it will be necessary to demonstrate RFP. This means that RACT measures need to be phased in to meet certain milestone goals and cannot all be delayed until the final deadline.

This basic process was applied to each of the four basic sectors of the emissions inventory:

Stationary Point sources:

As stated above, RACT refers to measures applicable to stationary sources. Thus, RACT is a type of RACM specifically designed for stationary sources.

Section 172 does not include any specific applicability thresholds to identify the size of sources that States and EPA must consider in the RACT and RACM analysis. In developing the emissions inventories underlying the SIP, the criteria of 40 CFR 51 for air emissions reporting requirements was used to establish a 100 ton per year threshold for identifying a sub-group of stationary point sources that would be evaluated individually. The cut-off was applied to either a sources reported emissions for 2008 or for its potential to emit in a given year. The rest of the point sources were assumed to represent a portion of the overall area source inventory.

Sources meeting the criteria described above were individually evaluated to determine whether their operations would be consistent with RACT.

SIPs for $PM_{2.5}$ must assure that the RACT requirement is met, either through a new RACT determination or a certification that previously required RACT controls (e.g. for another pollutant such as PM_{10}) represent RACT for $PM_{2.5}$.

With respect to prior technology determinations other than RACT, the rule provides that prior BACT and LAER determinations, in many cases but not all, would assure at least RACT level controls. Where a State has determined VOC to be a significant contributor to $PM_{2.5}$, compliance with MACT standards may be considered in VOC RACT determinations. EPA anticipates it will be unlikely that States can do much better than what the MACT controls currently require.

In conducting the analysis, UDAQ found that as a whole the large stationary sources were already operating with a high degree of emission control. It follows that the percentage of SIP related emissions reductions is not large relative to the overall quantity of emissions. As stated before, many of these sources were required to reduce emissions to address nonattainment issues with SO_2, ozone and PM_{10}. Routine permitting in these areas of nonattainment already includes BACT as an ongoing standard of review, even for minor sources and modifications. In order to find additional emission reductions at these sources, UDAQ identified a level of emission control that goes beyond reasonable, or RACT, and achieves the best available control.

Additional information regarding the RACT analysis for each of the sources in the nonattainment area may be found in the Technical Support Document.

For the Salt Lake City, UT nonattainment area, there are 28 stationary point sources that met or meet the criteria of 100 tons per year for $PM_{2.5}$ or any attainment plan precursor. Emissions from these sources, for the 2010 baseline as well as the projection years 2014, 2017 and 2019 are shown below in Table 6.3. Note that these emissions also include the growth projections that were applied. Information is provided in the TSD regarding the emissions reductions specific to reduction strategies resulting from the SIP.

Typical Winter Incversion Weekday Emissions (tons/day)											
		2010 Baseline (R2)					2014 (R43)				
NA Area	Site Name	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Salt Lake City - UT Nonattainment Area	ATK Thiokol Promontory	0.13	0.36	0.14	0.00	0.04	0.14	0.39	0.15	0.00	0.04
	Big West Refinery	0.17	0.70	1.28	0.31	1.07	0.17	0.69	1.28	0.31	1.05
	Bountiful City Power	0.00	0.00	0.00		0.00	0.08	0.21	0.05		0.00
	Central Valley Water	0.00	0.03	0.14	0.00	0.00	0.00	0.04	0.03	0.00	0.00
	CER Generation II LLC - WVC	0.02	0.04	0.00		0.00	0.02	0.04	0.00		0.00
	Chemical Lime Company	0.04	0.04	0.00	0.00	0.03	0.05	0.05	0.00	0.00	0.04
	Chevron Refinery	0.50	2.99	0.66	0.03	1.77	0.10	0.95	1.23	0.02	0.07
	Geneva Rock Point of Mountain	0.07	0.27	0.05		0.04	0.08	0.32	0.06		0.04
	Great Salt Lake Minerals - Production Plant	0.13	0.25	0.02	0.00	0.02	0.12	0.37	0.06	0.00	0.02
	Hexcel Corporation Salt Lake Operations	0.05	0.22	0.18	0.08	0.02	0.16	0.32	0.39	0.07	0.09
	Hill Air Force Base Main	0.04	0.52	0.83	0.01	0.01	0.04	0.57	0.83	0.01	0.01
	Holly Refining Marketing	0.15	0.85	0.66	0.06	1.32	0.22	1.09	0.67	0.30	0.31
	Interstate Brick Brick	0.18	0.11	0.01		0.04					
	Kennecott Mine Concentrator	0.65	8.49	0.50	0.00	0.01	0.85	12.13	0.65	0.00	0.01
	Kennecott NC-UPP-Lab-Tailings	0.01	0.02	0.01	0.00	0.00	0.12	0.02	0.01	0.00	0.00
	Kennecott Smelter & Refinery	0.61	0.47	0.03	0.02	3.02	0.80	0.73	0.06	0.02	3.69
	Murray City Power	0.00	0.00	0.00		0.00					
	Nucor Steel	0.16	0.50	0.20	0.01	0.12	0.35	0.93	0.35	0.00	0.81
	Olympia Sales Co.	0.01	0.00	0.07	0.00	0.00	0.00	0.00	0.09	0.00	0.00
	Pacificorp Gadsby	0.07	0.44	0.03	0.07	0.01	0.07	0.44	0.03	0.07	0.01
	Pacificorp Little Mountain	0.02	1.01	0.01		0.01					
	Proctor & Gamble Paper Products Co.	0.10	0.04	0.07		0.00	0.56	0.64	0.63		0.01
	Silver Eagle Refining	0.01	0.25	0.36	0.01	0.00					
	Tesoro Refinery	0.71	1.16	0.81	0.01	2.81	0.28	1.17	1.08	0.01	2.24
	University of Utah	0.02	0.31	0.02	0.01	0.00	0.03	0.25	0.02	0.01	0.00
	Utility Trailer	0.00	0.12	0.22		0.00					
	Vulcraft	0.02	0.02	0.15	0.00	0.00	0.04	0.03	0.20	0.00	0.00
	Wasatch Integrated IE	0.02	0.90	0.03	0.04	0.29	0.02	1.12	0.04	0.05	0.36
	Salt Lake City NA Total	**3.89**	**20.14**	**6.48**	**0.64**	**10.64**	**4.31**	**22.52**	**7.93**	**0.87**	**8.83**

Typical Winter Incversion Weekday Emissions (tons/day)											
		2017 (R2)					2019 (R49)				
NA Area	Site Name	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Salt Lake City - UT	ATK Thiokol Promontory	0.15	0.36	0.15	0.00	0.05	0.15	0.37	0.16	0.003	0.05
	Big West Refinery	0.17	0.69	1.28	0.31	1.05	0.09	0.62	1.26	0.31	0.39
	Bountiful City Power	0.08	0.21	0.05		0.00	0.08	0.21	0.05		0.00
	Central Valley Water	0.00	0.04	0.03	0.00	0.00	0.00	0.04	0.03	0.0001	0.00
	CER Generation II LLC - WVC	0.02	0.04	0.00		0.00	0.02	0.04	0.00		0.00
	Chemical Lime Company	0.05	0.06	0.00	0.00	0.05	0.05	0.05	0.00	0.0004	0.05
	Chevron Refinery	0.10	0.95	1.23	0.02	0.07	0.10	2.27	1.23	0.02	1.09
	Geneva Rock Point of Mountain	0.08	0.34	0.06		0.05	0.08	0.34	0.06		0.05
	Great Salt Lake Minerals - Production Plant	0.13	0.33	0.06	0.00	0.03	0.14	0.35	0.07	0.00	0.03
	Hexcel Corporation Salt Lake Operations	0.16	0.48	0.42	0.08	0.16	0.16	0.58	0.44	0.10	0.22
	Hill Air Force Base Main	0.04	0.61	0.88	0.01	0.01	0.04	0.63	0.92	0.01	0.01
	Holly Refining Marketing	0.22	1.09	0.67	0.30	0.31	0.22	1.07	0.66	0.30	0.24
	Interstate Brick Brick										
	Kennecott Mine Concentrator	0.85	12.13	0.65	0.00	0.01	0.85	12.13	0.65	0.004	0.01
	Kennecott NC-UPP-Lab-Tailings	0.30	0.20	0.07	0.00	0.03	0.30	0.20	0.07	0.001	0.03
	Kennecott Smelter & Refinery	0.89	0.82	0.07	0.03	4.09	0.96	0.88	0.08	0.03	4.47
	Murray City Power										
	Nucor Steel	0.37	1.01	0.37	0.00	0.87	0.40	1.08	0.40	0.005	0.94
	Olympia Sales Co.	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.11	0.00001	0.00
	Pacificorp Gadsby	0.07	0.40	0.03	0.07	0.01	0.07	0.40	0.03	0.07	0.01
	Pacificorp Little Mountain										
	Proctor & Gamble Paper Products Co.	0.61	0.71	0.69		0.01	0.66	0.76	0.75		0.01
	Silver Eagle Refining										
	Tesoro Refinery	0.28	1.17	1.08	0.01	2.24	0.27	0.82	1.01	0.01	0.82
	University of Utah	0.03	0.21	0.02	0.01	0.00	0.03	0.17	0.02	0.01	0.00
	Utility Trailer										
	Vulcraft	0.05	0.03	0.25	0.00	0.00	0.05	0.04	0.27	0.00004	0.00
	Wasatch Integrated IE	0.03	1.23	0.05	0.05	0.40	0.03	0.96	0.05	0.06	0.43
	Salt Lake City NA Total	**4.68**	**23.12**	**8.22**	**0.90**	**9.45**	**4.76**	**24.02**	**8.32**	**0.92**	**8.85**

Typical Winter Incversion Weekday Emissions (tons/day)											
		2017 (R2)					2019 (R57)				
NA Area	Site Name	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Salt Lake City - UT	ATK Thiokol Promontory	0.15	0.36	0.15	0.00	0.05	0.15	0.37	0.16	0.00	0.05
	Big West Refinery	0.17	0.69	1.28	0.31	1.05	0.09	0.62	1.26	0.31	0.39
	Bountiful City Power	0.08	0.21	0.05		0.00	0.08	0.21	0.05		0.00
	Central Valley Water	0.00	0.04	0.03	0.00	0.00	0.00	0.04	0.03	0.00	0.00
	CER Generation II LLC - WVC	0.02	0.04	0.00		0.00	0.02	0.04	0.00		0.00
	Chemical Lime Company	0.05	0.06	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.05
	Chevron Refinery	0.10	0.95	1.23	0.02	0.07	0.10	2.27	1.23	0.02	1.09
	Geneva Rock Point of Mountain	0.08	0.34	0.06		0.05	0.08	0.34	0.06		0.05
	Great Salt Lake Minerals - Production Plant	0.13	0.33	0.06	0.00	0.03	0.14	0.35	0.07	0.00	0.03
	Hexcel Corporation Salt Lake Operations	0.16	0.48	0.42	0.08	0.16	0.16	0.30	0.47	0.10	0.09
	Hill Air Force Base Main	0.04	0.61	0.88	0.01	0.01	0.04	0.65	0.96	0.01	0.01
	Holly Refining Marketing	0.22	1.09	0.67	0.30	0.31	0.13	0.93	0.70	0.65	0.31
	Interstate Brick Brick										
	Kennecott Mine Concentrator	0.85	12.13	0.65	0.00	0.01	0.90	14.33	0.78	0.01	0.02
	Kennecott NC-UPP-Lab-Tailings	0.30	0.20	0.07	0.00	0.03	0.30	0.20	0.07	0.00	0.03
	Kennecott Smelter & Refinery	0.89	0.82	0.07	0.03	4.09	0.96	0.88	0.08	0.03	4.47
	Murray City Power										
	Nucor Steel	0.37	1.01	0.37	0.00	0.87	0.40	1.08	0.40	0.00	0.94
	Olympia Sales Co.	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.11	0.00	0.00
	Pacificorp Gadsby	0.07	0.40	0.03	0.07	0.01	0.07	0.40	0.03	0.07	0.01
	Pacificorp Little Mountain										
	Proctor & Gamble Paper Products Co.	0.61	0.71	0.69		0.01	0.66	0.76	0.75		0.01
	Silver Eagle Refining										
	Tesoro Refinery	0.28	1.17	1.08	0.01	2.24	0.27	0.82	1.01	0.01	0.82
	University of Utah	0.03	0.21	0.02	0.01	0.00	0.03	0.17	0.02	0.01	0.00
	Utility Trailer										
	Vulcraft	0.05	0.03	0.25	0.00	0.00	0.05	0.04	1.13	0.00	0.00
	Wasatch Integrated IE	0.03	1.23	0.05	0.05	0.40	0.03	0.96	0.05	0.06	0.43
	Salt Lake City NA Total	**4.68**	**23.12**	**8.22**	**0.90**	**9.45**	**4.72**	**25.82**	**9.43**	**1.28**	**8.79**

Table 6.3, Point Source Emissions; Baseline and Projections with Growth and Control

Area sources:

As part of the RACT analysis for area sources, consideration was given to a broad list of source categories. Table 6.4 identifies these categories as well as the pollutant(s) likely to be controlled, and provides some remarks as to whether a control strategy was ultimately pursued. In considering what source categories might be considered, Utah made use of EPA recommendations as well as control strategies from other states. DAQ evaluated each strategy for technical feasibility as part of the RACT analysis. The screening column in table 6.4 identifies whether or not a strategy was retained for rulemaking or screened out for impracticability.

Table 6.4 Area Source Strategy Screening

Strategy	Constituent(s)	SCREENING STATUS	REMARKS
1. Repeal current surface coating rule, R307-340. Replace this rule with individual rules for each category. New rules include PM2.5 nonattainment areas. New rules update applicability and control limits to most current CTG. Current rule includes, paper, fabric and vinyl, metal furniture, large appliance, magnet wire, flat wood, miscellaneous metal parts and graphic arts.	VOC	Retained	R307-340 previously applied to Davis and Salt Lake counties. R307-340 was withdrawn and re-enacted as separate rules for each existing category. The new rules were expanded to nonattainment areas and updated to the most current RACT based limit(s).
2. New separate surface coating rules for following sources: a. Aerospace b. High performance c. Architectural d. Marine e. Sheet, strip & coil f. Traffic markings g. Plastic parts	VOC	See Remarks Column	Aerospace – retained High performance – screened, regulated under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Architectural – initially screened, further research indicated that adopting the Ozone Transport Commission model rule is feasible. Marine – screened, only 1.2 tpy Sheet, strip & coil – retained Traffic markings - screened, regulated under FIFRA Plastic parts - retained
3. Agricultural practices using Natural Resources Conservation Service (NRSC) practice standards	VOC, $PM_{2.5}$, ammonia	Screened	The NRCS has already enrolled most farmers in the erodible regions in their program thereby negating the need for rulemaking
4. Consumer products rule regulating VOC content	VOC	Retained	
5. Adhesives and sealant rule	VOC	Retained	
6. Expand current solvent degreasing rule R307-335 to $PM_{2.5}$ nonattainment areas and add a new section on industrial solvent cleaning	VOC	Retained	
7. Automobile refinishing rule	VOC	Retained	
8. Expand wood furniture manufacturing rule to $PM_{2.5}$ nonattainment areas. Update to most current CTG.	VOC	Retained	
9. Lower the no burn cut point for residential use of solid fuel burning devices. Require new sale of EPA certified stoves/fireplaces. Prohibit the sale/resale of noncertified stoves in nonattainment areas.	VOC, $PM_{2.5}$, NO_x, SO_x, ammonia	Retained	
10. Ban new sales of stick type outdoor wood boilers in nonattainment areas.	VOC, $PM_{2.5}$, NO_x, SO_x, ammonia	Retained	
11. Industrial bakery rule	VOC	Initially Retained	Screened out after analysis of public comment, cost benefit analysis does not support rulemaking, high cost-low VOC reduction
12. Chain-driven charbroiler restaurant emission control	VOC, $PM_{2.5}$	Retained	
13. Appliance pilot light phase out	VOC, $PM_{2.5}$, NO_x, SO_x, ammonia	Retained	

Strategy	Constituent(s)	SCREENING STATUS	REMARKS
14. Expand current fugitive dust rule, R307-309 to $PM_{2.5}$ nonattainment areas. Require BMP's for dust plans.	$PM_{2.5}$	Retained	
15. Amend fugitive dust rule to include cattle feed lot	$PM_{2.5}$	Screened	Sizeable feed lots are not located in nonattainment areas
16. Low NO_x burners in commercial, industrial, and institutional boilers	VOC, NO_x	Retained	
17. Chemical additives to manure	VOC, ammonia	Screened	Costly with limited control efficiency. Excess ammonia in inventory that would not be sufficient to be effective
18. Ban testing of back-up generators on red-alert days	VOC, $PM_{2.5}$, NO_x, SO_x	Initially Retained	Screened out after review of public comment, rule implementation was more complicated than anticipated, generators cannot be easily reprogrammed
19. Prohibit use of cutback asphalt	VOC	Screened	Cities and highway administration personnel need stockpile for winter time road repair. Very small inventory.
20. Control limits on aggregate processing operations and asphalt manufacturing	$PM_{2.5}$, NO_x, SO_x	Retained	
21. R307-307 Road Salt and Sanding	PM	Retained	Expand current rule to nonattainment areas

EPA has developed control measure guidance documents called, control techniques guidelines (CTGs) for volatile organic compounds (VOCs). CTGs are used as presumptive RACT for VOCs and are guidance in SIP rulemaking. DAQ has evaluated all VOC CTGs for area sources as part of the SIP process.

As noted above, many CTGs were previously adopted into Utah's air quality rules to address ozone nonattainment in Salt Lake and Davis Counties. In conducting this evaluation, consideration was given to whether an expansion of applicability for an existing CTG into additional counties would provide a benefit for $PM_{2.5}$, and whether a strengthening of existing CTG requirements in Salt Lake and Davis Counties would result in an incremental benefit that was economically feasible. Furthermore, EPA has updated some of its existing CTGs and added some new ones to the list.

As part of this SIP, Utah has identified relevant source categories covered by CTGs, and assembled draft rules, based on these CTGs, for reducing emissions from these categories. These rules will apply to the following source categories:

- Control of Volatile Organic Emissions from Surface Coating of Cans, Coils, Paper, Fabrics, Automobiles, and Light-Duty Trucks
- Control of Volatile Organic Emissions from Solvent Metal Cleaning
- Control of Volatile Organic Emissions from Surface Coating of Insulation of Magnet Wire
- Control of Volatile Organic Emissions from Graphic Arts
- Control of Volatile Organic Compound Emissions from Wood Furniture Manufacturing Operations
- Control Techniques Guidelines for Industrial Cleaning Solvents
- Control Techniques Guidelines for Flat Wood Paneling Coatings

- Control Techniques Guidelines for Paper, Film, and Foil Coatings
- Control Techniques Guidelines for Large Appliance Coatings
- Control Techniques Guidelines for Metal Furniture Coatings
- Control Techniques Guidelines for Miscellaneous Metal and Plastic Parts Coatings
- Control of Volatile Organic Emissions from Coating Operations at Aerospace Manufacturing and Rework Operations

While most VOC sources are addressed by CTGs, the remaining emission sources must be evaluated by engineering analysis, including an evaluation of rulings by other states including model rules developed by the Ozone Transport Commission. These include VOCs from autobody refinishing, restaurant charbroiling, and phasing out appliance pilot lights.

CTGs for $PM_{2.5}$ emissions sources do not exist. RACT for $PM_{2.5}$ has been established through information from varied EPA and other state SIP sources. A useful source of data is the AP 42 Compilation of Air Pollutant Emission Factors, first published by the US Public Health Service in 1968. In 1972, it was revised and issued as the second edition by the EPA. The emission factor/control information was applied to fugitive dust and mining strategies.

Table 6.5 shows the effectiveness (emissions reductions) of the area source SIP control strategy for the Salt Lake City, UT nonattainment area. Most of these rules become effective by January 1, 2014.

Salt Lake City - UT Nonattainment Area												
	2014 lb/day				2017 lb/day				2019 lb/day			
	NOX	PM2_5	SO2	VOC	NOX	PM2_5	SO2	VOC	NOX	PM2_5	SO2	VOC
Area Source Rules												
R307-302, Solid fuel burning	1,633.5	13,188.8	273.1	16,501.5	2,041.8	16,485.9	341.3	20,627.1	3,480.8	28,162.2	581.3	35,234.9
R307-303, Commercial cooking		380.1		98.1		370.4		95.6		407.0		105.0
R307-309, Fugitive dust		196.0				191.8				255.0		
R307-312, Aggregate processing operations		5.0				4.7				5.0		
R307-335, Degreasing				4,079.0				986.7				4,325.0
R307-342, Adhesives & sealants				2,227.0				2,169.6				2,387.0
R307-343, Wood manufacturing				1,206.0				1,175.9				1,276.0
R307-344, Paper, film & foil coating				1,315.0				1,279.2				1,328.0
R307-345, Fabric & vinyl coating				37.0				1,462.4				1,871.0
R307-346, Metal furniture coating				100.0				97.6				100.0
R307-347, Large appliance coating				3.0				3.4				3.0
R307-348, Magnet wire coating				9.0				9.3				9.0
R307-349, Flat wood panel coating				77.0				74.9				116.0
R307-350 Miscellaneous metal parts coating				2,653.0				2,587.7				2,681.0
machinery				151.0				147.0				159.0
other transportation				234.0				229.3				242.0
Special				4.0				4.1				5.0
R307-351, Graphic arts				1,917.0				1,917.2				2,215.0
R307-352, Metal containers				185.0				182.4				185.0
R307-353, Plastic coating				412.0				304.7				390.0
R307-354, Auto body refinishing				2,618.0				2,553.1				2,766.0
R307-355, Aerospace coatings				463.0				454.4				480.0
R307-356, Appliance pilot light	663.8	3.0	4.2	38.8	3,002.5	13.7	19.2	175.7	2,918.5	13.4	18.6	170.8
R307-357, Consumer products				3,840.0				3,735.6				4,116.0
R307-361, Architectural coatings				8,473.0				18,244.0				9,082.0
TOTAL	**2,297.3**	**13,773.0**	**277.3**	**46,641.5**	**5,044.3**	**17,066.6**	**360.5**	**58,516.9**	**6,399.3**	**28,842.5**	**600.0**	**69,246.6**

Table 6.5, Emissions Reductions from Area Source SIP Controls

On-road mobile sources:

A decentralized, test-and-repair program was evaluated for Box Elder and Tooele counties within the nonattainment area. For the evaluation, all model year 1968 and newer vehicles would be subject to a biennial test except for exempt vehicles. The program would exempt vehicles less than four years old as of January 1 on any given year from an emissions inspection. Year 1996 and newer vehicles would be subject to an On-Board Diagnostics (OBD) inspection. Year 1995 and older vehicles would be subject to a two-speed idle inspection (TSI). Based on this evaluation, this program was not included because it was determined that implementation of such a program would not affect PM 2.5 concentrations at the controlling monitor (Hawthorne) for the Salt Lake-Ogden-Clearfield nonattainment area. Additional information is provided in the Technical Support Document.

Off-road mobile sources:

Beyond the existing controls reflected in the projection-year inventories and the air quality modeling there are no emission controls that would apply to this source category.

Chapter 7 – TRANSPORTATION CONFORMITY

7.1 Introduction

The federal Clean Air Act (CAA) requires that transportation plans and programs within the Salt Lake City, Utah $PM_{2.5}$ nonattainment area conform to the air quality plans in the region prior to being approved by the Wasatch Front Regional Council (WFRC) Metropolitan Planning Organization. Demonstration of transportation conformity is a condition to receive federal funding for transportation activities that are consistent with air quality goals established in the Utah State Implementation Plan (SIP). The CAA regulates air pollutant emissions from mobile sources by establishing motor vehicle emissions budgets in the SIP. Transportation conformity requirements are intended to ensure that transportation activities do not interfere with air quality progress. Conformity applies to on-road mobile source emissions from regional transportation plans (RTPs), transportation improvement programs (TIPs), and projects funded or approved by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA) in areas that do not meet or previously have not met the National Ambient Air Quality Standards (NAAQS) for ozone, carbon monoxide, particulate matter less than 10 micrometers in diameter (PM_{10}), particulate matter 2.5 micrometers in diameter or less ($PM_{2.5}$), or nitrogen dioxide.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFTEA-LU) and section 176(c)(2)(A) of the CAA require that all regionally significant highway and transit projects in air quality nonattainment areas be derived from a "conforming" transportation plan. Section 176(c) of the CAA requires that transportation plans, programs, and projects conform to applicable air quality plans before being approved by an MPO. Conformity to an implementation plan means that proposed activities must not (1) cause or contribute to any new violation of any standard in any area, (2) increase the frequency or severity of any existing violation of any standard in any area, or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The plans and programs produced by the transportation planning process of the WFRC are required to conform to the on-road mobile source emissions budgets established in the SIP. Approval of conformity is determined by the FHWA and FTA.

7.2 Consultation

The Interagency Consultation Team (ICT) is an air quality workgroup in Utah that makes technical and policy recommendations regarding transportation conformity issues related to the SIP development and transportation planning process. Section XII of the SIP established the ICT workgroup and defines the roles and responsibilities of the participating agencies. Members of the ICT workgroup collaborated on a regular basis during the development of the $PM_{2.5}$ SIP. They also meet on a regular basis regarding transportation conformity and air quality issues. The ICT workgroup is comprised of management and technical staff members from the affected agencies associated directly with transportation conformity.

ICT Workgroup Agencies

- Utah Division of Air Quality (UDAQ)
- Metropolitan Planning Organizations MPOs
    - Cache MPO
    - Wasatch Front Regional Council
    - Mountainland Association of Governments
- Utah Department of Transportation (UDOT)
- Utah Local Public Transit Agencies
- Federal Highway Administration (FHWA)
- Federal Transit Administration (FTA)
- U.S. Environmental Protection Agency (EPA)

7.3 Regional Emission Analysis

The regional emissions analysis is the primary component of transportation conformity and is administered by the lead transportation agency located in the EPA designated air quality nonattainment area. In December 2009, EPA designated all of Davis and Salt Lake Counties and parts of Box Elder, Tooele, and Weber as the Salt Lake City, Utah $PM_{2.5}$ nonattainment area. The responsible transportation planning organization for the Utah Salt Lake City nonattainment area is covered the Wasatch Front Regional Council (WFRC).

The motor vehicle emissions budget serves as a regulatory limit for on-road mobile source emissions. Motor vehicle emissions limits are defined in 40 CFR 93.101 as "that portion of the total allowable emissions defined in the submitted or approved control strategy implementation plan revision or maintenance plan for a certain date for the purpose of meeting reasonable further progress milestones or demonstrating attainment or maintenance of the NAAQS, for any criteria pollutant or its precursors, allocated to highway and transit vehicle use and emissions." As a condition to receive federal transportation funding, transportation plans, programs, and projects are required to meet those emission budgets through strategies that increase the efficiency of the transportation system and reduce motor vehicle use.

The conformity test consists of either an interim emissions test or a motor vehicle emissions budgets test. The interim conformity test requirements apply until either EPA has declared the motor vehicle emissions budgets adequate for transportation conformity purposes or until EPA approves the $PM_{2.5}$ SIP.

7.4 Interim $PM_{2.5}$ Conformity Test

The EPA interim conformity test for $PM_{2.5}$ emissions requires that future nitrogen oxides (NO_x) and directly emitted $PM_{2.5}$ emissions from RTPs, TIPs, and projects funded or approved by the FHWA or the FTA not exceed 2008 levels. NO_x emissions are a gaseous $PM_{2.5}$ precursor emissions emitted from vehicle exhaust related emissions. Primary particulate emissions consist of particles emitted from vehicle exhaust (elemental carbon, organic carbon, and SO_4) and brake and tire wear. The interim conformity test requirements apply until EPA has declared the motor vehicle emissions budgets adequate for transportation conformity purposes or until it approves the $PM_{2.5}$ SIP.

7.5 Transportation $PM_{2.5}$ Budget Test Requirements

The WFRC collaborated with the ICT workgroup on interim conformity and SIP related issues prior to receiving the official EPA designation status of nonattainment for $PM_{2.5}$. During the SIP development process the WFRC coordinated with the ICT workgroup and developed $PM_{2.5}$ SIP motor vehicle emissions [~~budgets~~]inventories using the latest planning assumptions and tools for traffic analysis and the EPA approved Motor Vehicle Emission Simulator (MOVES) emissions model. Local MOVES modeling data inputs were cooperatively developed by WFRC and the ICT workgroup using EPA recommended methods where applicable.

7.6 Transportation Conformity $PM_{2.5}$ Components

The transportation conformity requirements found in 40 CFR 93.102 require that the $PM_{2.5}$ SIP include motor vehicle emissions budgets for directly emitted $PM_{2.5}$; motor vehicle emissions from tailpipe, brake and tire wear; and emissions of nitrogen oxide (NO_x), a gaseous $PM_{2.5}$ precursor. Because UDAQ has identified volatile organic compounds (VOCs) as a $PM_{2.5}$ precursor that significantly impact $PM_{2.5}$ concentrations, the SIP will need a VOC motor vehicle emissions budget for transportation conformity purposes. The EPA conformity rule presumes that $PM_{2.5}$ re-entrained road dust does not need to be included in the interim conformity test or have an established motor vehicle emissions budget unless either the State or EPA decides that re-entrained road dust emissions are a significant contributor to the $PM_{2.5}$ nonattainment problem. The UDAQ conducted a re-entrained road dust study that concluded that $PM_{2.5}$ re-entrained road dust emissions are negligible in the Salt Lake City, Utah $PM_{2.5}$

nonattainment area and meet the criteria of 40 CFR 93.102(b)(3). EPA Region 8 reviewed the study and concurred with the UDAQ's findings. A similar analysis was undertaken to address direct $PM_{2.5}$ emissions, but in this case the conclusion was otherwise. Therefore, a motor vehicle emissions budget for direct $PM_{2.5}$ is established in this SIP.

7.7 Transportation Conformity $PM_{2.5}$ Budgets

This plan includes reasonable further progress demonstrations for 2014 and 2017 and attainment of the $PM_{2.5}$ standard is projected by 2019.

In this SIP, the state is establishing transportation conformity motor vehicle emission budgets (MVEB) for NO_x, VOC , and direct $PM_{2.5}$ (elemental carbon, organic carbon, SO_4, brake and tire wear) for 2014, 2017, and 2019. The Transportation Conformity $PM_{2.5}$ budgets emissions estimates for the mobile sources are calculated from the EPA approved Motor Vehicle Emission Simulator Model (EPA MOVES 2010a).

[~~WFRC~~]Salt Lake City - UT Non-attainment Area Transportation Conformity Budgets (tons per average winter week day)

	Direct $PM_{2.5}$	NO_x	VOC
2014	5.01	80.00	47.50
2017	4.55	66.98	40.11
2019	3.71	51.68	30.55

Table 7.1, Emissions Budgets for Transportation Conformity Purposes (EPA MOVES 2010a). Note: VOC emissions do not include refueling spillage and displacement vapor loss. Budgets are rounded to the nearest hundredth ton.

Table 7.2 shows subtotals for VOC refueling and fugitive dust emissions. These emissions are not included in the transportation conformity MVEBs for the Salt Lake City – UT Non-attainment Area. Emissions from Table 7.1 and 7.2 can be summed to equal total VOC and $PM_{2.5}$ emissions that were modeled and reported in Table 4.2.

VOC Refueling and Fugitive Dust Emissions for the Salt Lake City – UT Non-attainment Area (tons per average winter week day)

	VOC Refueling	Fugitive Dust
2014	2.12	3.50
2017	1.69	3.67
2019	1.31	3.54

Table 7.2. VOC Refueling and Fugitive Dust Emissions for the Salt Lake City - UT Non-attainment Area.

Per section 93.124 of the conformity regulations, for transportation conformity analyses using these budgets in analysis years beyond 2019, a trading mechanism is established to allow future increases in on-road direct $PM_{2.5}$ emissions to be offset by future decreases in plan precursor emissions from on-road mobile sources at appropriate ratios established by the air quality model. Future increases in on-road direct $PM_{2.5}$ emissions may be offset with future decreases in NOx emissions from on-road mobile sources at a NOx:$PM_{2.5}$ ratio of 11.44:1 and/or future decreases in VOC emissions from on-road mobile sources at a VOC:$PM_{2.5}$ ratio of 4.72:1. This trading mechanism will only be used if needed for conformity analyses for years after 2019. To ensure that the trading mechanism does not impact the ability to meet the NOx or VOC budgets, the NOx emission reductions available to supplement the direct $PM_{2.5}$ budget shall only be those remaining after the 2019 NOx budget has been met, and the VOC emissions reductions available to supplement the direct $PM_{2.5}$ budget shall only be those remaining after the 2019 VOC budget has been met. Clear documentation of the calculations used in the trading should be included in the conformity analysis.

Chapter 8 – REASONABLE FURTHER PROGRESS

8.1 Introduction

Clean Air Act Section 172(c)(2) requires that plans for nonattainment areas "shall require reasonable further progress (RFP)." In general terms, the goal of these RFP requirements is for areas to achieve generally linear progress toward attainment, as opposed to deferring implementation of all measures until the end, one year prior to the attainment date identified in the SIP.

For areas with an attainment date of 2014 or earlier the attainment demonstration would also be considered to demonstrate that the area is achieving RFP, and there would be no requirement to submit a separate reasonable further progress plan.

For areas with an attainment date beyond 2014, a State is required to submit an RFP plan along with its attainment demonstration and SIP. These plans must demonstrate that generally linear reductions in emissions will occur by 2014, i.e. that emissions in 2014 will be reduced to the extent represented by a generally linear progression from base year emissions (2010) to attainment-level emissions. For any area that needs an extension of the attainment deadline to 2018 or 2019, the State's RFP plan would also need to demonstrate that generally linear reductions will be achieved in the 2017 emissions year as well. The pollutants to be addressed in the RFP plan are those pollutants that are identified as significant for purposes of control measures in the attainment plan.

8.2 RFP for the Salt Lake City, UT Nonattainment Area

The attainment demonstration for the Salt Lake City, UT $PM_{2.5}$ nonattainment area shows that the 24-hr NAAQS will be achieved, but not until 2019. Therefore, this SIP identifies and proposes an attainment date of December 14, 2019.

As stated above, a State is required to submit an RFP plan along with its attainment demonstration and SIP for areas with an attainment date beyond 2014. Furthermore, the State's RFP plan would also need to include a demonstration for the 2017 emissions year.

The representation of generally linear progress is based on the notion that reductions in emissions will result in commensurate reductions in $PM_{2.5}$ concentrations. Hence, as described in the regulations, the RFP showing is based on emissions. Nevertheless, EPA acknowledges that $PM_{2.5}$ mitigation also involves a number of attainment plan precursors and that the associated chemistry is non-linear. Thus, States are given some flexibility to adopt any combination of controls involving the various pollutants that can be shown to provide equivalent benefits using procedures that EPA is recommending (or, at the State's option, air quality modeling).

The RFP plan must demonstrate that in each applicable milestone year, emissions will be at a level consistent with generally linear progress in reducing emissions between the base year and the attainment year.

The base year for the attainment demonstration underlying this plan is 2010. Therefore, the baseline year inventory for the RFP plan will also be 2010.

In keeping with the notion of linear progress, Subpart Z of 40 CFR 51 (at 51.1009) specifies four quantities to be calculated in the RFP plan. These quantities are:

- Full Implementation Reduction, equals: (baseline inventory) – (attainment inventory)
- Milestone Date Fraction, equals: (milestone year – 2010) / (2019 – 2010)
- Benchmark Emission Reduction, and equals: (Full Imp. Reduction) * (Milestone Date Fraction)
- Benchmark Emission Level equals: (baseline inv.) – (Benchmark Reduction)

Together, these four quantities result in the familiar mathematical equation for a straight line: $y = mx + b$. Without reporting the intermediate results of each of these quantities, Table 8.1 presents this information for emission levels of $PM_{2.5}$ and each of the attainment plan precursors: NO_x, SO_2, and VOC. For milestone years 2014 and 2017, the values representing straight linear progress are reported under the column heading "rfp". The other column for that year represents the projected emissions modeled in the attainment demonstration (labeled "projected").

For the attainment year 2019, the end point to the straight line, there is only one column.

The RFP plan must describe the control measures that provide for meeting the reasonable further progress milestones for the area, the timing of implementation of those measures, and the expected reductions in emissions of direct $PM_{2.5}$ and $PM_{2.5}$ attainment plan precursors. For a discussion of the control measures factored into the attainment demonstration, and hence reflected in the modeled emissions totals (in the "projected" column), see Chapter 6 of the Plan.

Reasonable Further Progress Salt Lake City, UT PM2.5 Nonattainment Area						
***Emissions / Year**	**2010**	**2014**		**2017**		**2019**
		projected	rfp	projected	rfp	
PM2.5	19.6	18.6	18.6	18.4	17.8	17.3
NOx	160.5	140.4	138.4	124.2	121.8	110.7
SO2	12.8	10.9	12.0	11.2	11.3	10.9
VOC	130.0	104.9	109.7	93.6	94.5	84.4
Plan precursors	303.3	256.2	260.1	229.0	227.6	206.0
Total	323.0	274.8	278.7	247.3	245.5	223.3
****Concentration**	42	37	39	37	37	35

* Emissions are presented in tons per average winter day
**Value for 2010 is Baseline design value for the Hawthorne monitor

Reasonable Further Progress Salt Lake City, UT PM2.5 Nonattainment Area						
***Emissions / Year**	**2010**	**2014**		**2017**		**2019**
		projected	rfp	projected	rfp	
PM2.5	19.6	18.6	18.6	18.4	17.8	17.3
NOx	160.5	140.4	139.2	124.2	123.2	112.5
SO2	12.8	10.9	11.9	11.2	11.3	10.8
VOC	130.0	104.9	110.2	93.6	95.4	85.5
Plan precursors	303.3	256.2	261.4	229.0	229.9	208.9
Total	323.0	274.8	279.9	247.3	247.7	226.2
****Concentration**	42	37	39	37	37	35

* Emissions are presented in tons per average winter day
**Value for 2010 is Baseline design value for the Hawthorne monitor

Table 8.1, Reasonable Further Progress Benchmarks for the Salt Lake City, UT Nonattainment Area

The RFP plan must demonstrate that emissions for the milestone year are at levels roughly equivalent to the benchmark emission levels for direct $PM_{2.5}$ emissions and each $PM_{2.5}$ attainment plan precursor to be addressed in the plan. Table 8.1 shows this to be the case for $PM_{2.5}$, each of the plan precursors, all of the plan precursors, and the total for all of the pollutants.

In addition to the emissions totals, the table also includes the 2010 baseline design value for the controlling monitor (Hawthorne) in the nonattainment area and the predicted $PM_{2.5}$ concentrations for each of the milestones. These concentrations are presented as another metric to establish how much improvement is necessary to meet the 24-hour standard. The RFP rule allows for a generally equivalent improvement in air quality by the milestone year as would be achieved under the benchmark RFP plan, where "equivalence" would make use of the information developed for the attainment plan to assess the relationship between emissions reductions and predicted reductions in $PM_{2.5}$ concentrations. Table 8.1 also shows the predicted $PM_{2.5}$ concentrations to be at or better than linear progress.

Motor Vehicle Emissions: 40 CFR 51.1009 also requires that State shall include in its RFP submittal an inventory of on-road mobile source emissions in the nonattainment area. This requirement is for the purposes of establishing motor vehicle emissions budgets for transportation conformity purposes (as required in 40 CFR Part 93).

Table 8.2 presents emissions totals for on-road mobile sources. These are the same totals that factor into the overall emissions reported in the preceding RFP table. For a more specific discussion of motor vehicle emissions budgets for transportation conformity purposes, see Chapter 7 of this Plan.

Mobile Source Emissions				
Salt Lake City, UT PM2.5 Nonattainment Area				
***Emissions / Year**	**2010**	**2014**	**2017**	**2019**
****PM2.5**	8.6	8.5	8.2	7.3
NOx	99.6	80.0	67.0	51.7
*****VOC**	62.5	49.6	41.8	31.9
* Emissions are presented in tons per average winter day				
** PM2.5 emissions include: tailpipe PM2.5, SO4, brakewear, tire-wear, and re-entrained road dust				
*** VOC totals include refueling emissions				

Table 8.2, Motor Vehicle Emissions for Purposes of RFP

Chapter 9 – CONTINGENCY MEASURES

9.1 Background

Consistent with section 172(c)(9) of the Act, the State must submit in each attainment plan specific contingency measures to be undertaken if the area fails to make reasonable further progress, or fails to attain the $PM_{2.5}$ NAAQS by its attainment date. The contingency measures must take effect without significant further action by the State or EPA.

Nothing in the statute precludes a State from implementing such measures before they are triggered, but the credit for a contingency measure may not be used in either the attainment or reasonable further progress demonstrations.

The SIP should contain trigger mechanisms for the contingency measures, specify a schedule for implementation, and indicate that the measures will be implemented without further action by the State or by EPA.

The CAA does not include the specific level of emission reductions that must be adopted to meet the contingency measures requirement under section 172(c)(9). Nevertheless, in the preamble to the Clean Air Fine Particulate Rule (see 72 FR 20643) EPA recommends that the "emissions reductions anticipated by the contingency measures should be equal to approximately 1 year's worth of emissions reductions necessary to achieve RFP for the area."

9.2 Contingency Measures and Implementation Schedules for the Nonattainment Area

The following measures have been set aside for contingency purposes:

<u>Woodburning Control</u> – No-burn days are presently called at 35 $\mu g/m^3$. By this time the area is already at the 24-hr health standard, and it is likely that air dispersion is very poor. As part of the control strategy for the SIP, rule R307-302 has been amended to change the no-burn call to 25 $\mu g/m^3$. Credit for this change is included in the modeled attainment demonstration as well as the RFP demonstration. However, R307-302 also includes a mechanism to further revise the no-burn call to only 15 $\mu g/m^3$ should a contingency situation arise. The benefit of this rule is to prevent a buildup of particulate matter due to woodsmoke during periods of poor atmospheric mixing which typically precede exceedances of the 24-hour $PM_{2.5}$ NAAQS. This rule has been adopted, and can take effect immediately if so required.

9.3 Conclusions

Control measures developed to meet increasingly stringent ozone and fine PM standards in Utah's urbanized areas have likewise become increasingly stringent, and still it is a challenge to attain the 2006 $PM_{2.5}$ NAAQS. This leaves little room for additional reductions that can be set aside as contingency measures.

The control strategy analysis summarized in Chapter 6 shows that stationary sources already meet or exceed RACT, and represent at most about 20% of the emissions contributing to excessive $PM_{2.5}$ concentrations during winter. By contrast, area sources and on-road mobile sources contribute most of the emissions, but further emission control in these categories extends beyond the authorities of UDAQ. The most meaningful reductions in future emissions of VOC, the most important of all the attainment plan precursors, will likely result from additional restrictions of VOC in consumer products, and from what will likely result from Tier III of the federal motor vehicle control program.

PM2.5 SIP Section X.A.21 and X.A.22 Public Comments: Summaries and Responses to Comments Made During the October 2013 Public Comment Period and Public Hearings.

November 25, 2013

TABLE OF CONTENTS

GENERAL COMMENTS

G-1 [submitted by John Knoblock]: Mr. Knoblock suggested that looking at South Coast Air Quality Management (SCAQM) rules would go a long way in solving Utah's PM2.5 problem without needing to "reinvent the wheel." He specifically asked how Utah's rules compare to those at SCAQM.

Response to G-1: It is first important to note that the mix of sources, geophysical characteristics and inversion chemistry of the Wasatch Front and SCAQM differ; therefore, we can make a relative comparison, but we must remember that not all controls implemented by SCAQM would apply to Utah.

The rule development process for area sources requires us to first evaluate what is technically feasible and cost-effective, including evaluating what other air jurisdictions have promulgated. SCAQM has been a leader in area source rule development because that district has been in nonattainment for many years. Consequently, a great deal of the technical information available to air quality planners for area sources comes from the work conducted by the SCAQM. In fact, EPA comments on area source rules generally include a comparative analysis between our rules and California air district rules. DAQ developed regulations for all significant area source categories in our inventory and all of those rules are either equivalent to, or more restrictive than SCAQM rules. For example, the Air Quality Board approved a rule to ban outdoor wood boilers in the nonattainment area. No such rule exists in the SCAQM. The Board has approved the most restrictive architectural coatings rule in the country. Our adhesives and consumer products rules are also at the forefront in the country at this time. Some of the California air districts have more stringent cooking rules that apply to very large restaurants because their restaurant emissions are far greater than ours. Please refer to response to comment number A-6 for a detailed explanation of why the Utah cooking rule differs from California rules.

G-2 [submitted by John Knoblock]: Comparing UDAQ rules and policies to those of California's South Coast and Bay Area Air Quality Management Districts; California has experienced success placing a plant-wide cap on large industrial sources. Over time, the cap can be reduced through improvements in technology and New Source Review.

Response to G-2: DAQ appreciates the suggestion. Depending on the configuration of a source it may or may not be appropriate to structure the determination of compliance as a plant-wide cap. The refineries offer a good example of a source type where this approach makes sense, and DAQ has capped much of their emissions while still requiring specific units to meet technologically based emission limits. The commenter also makes a good point with respect to New Source Review; in that technology does move forward, and that on-going NSR activity does serve to require updates to technology that helps lower emissions.

G-3 [submitted by John Knoblock]: California air districts have more resources; a comparison should be made to show our politicians the disproportionality.

Response to G-3: Because the air quality problems, sources of emissions, and funding available through the legislature are different in California than they are in Utah, a comparison of resources would be of little benefit.

G-4 [submitted by Diane Menuz]: Ms. Menuz asked if there could be a list for people to sign up for to receive automatic phone messages when it is a no-burn day. She also asked if funds can be raised to help people who rely on wood stoves replace them with other home heating options. She further suggests that funding could come from point sources.

Response to G-4: The DAQ currently uses a listserve to notify interested parties about changes to the wood burn/action status. As technology changes we evaluate new means of communication. While the DAQ does not have funding for such an endeavor, any effort that industry or others could make to switch out wood stoves would be beneficial.

G-5 [submitted by George Chapman]: Mr. Chapman recommended that DAQ redo the red yellow green system to forecast when emissions have to be reduced beforehand when inversions are upcoming.

Response to G-5: This year the DAQ has implemented a new forecasting program that is intended to be proactive. This program is in response to rule changes adopted by the Air Quality Board in the fall of 2012. The new program is designed to warn citizens much earlier of pollution level increases and to implement voluntary and mandatory actions at a much earlier level than previously. The forecasting is based on many factors including pollution levels, weather patterns, temperature, snow pack, etc., and is used to make a three day forecast.

G-6 [submitted by HEAL Utah, Utah Physicians, Eleanor Thompson]: We think the DAQ should have allowed the public an additional 30 days to comment on the proposed plans.

Response to G-6: DAQ understands the difficulty of both absorbing and providing meaningful comment on so much material in a very limited amount of time. Nevertheless, the SIP is almost a year late and we have made a commitment to EPA that we would delay no further. DAQ would also like to have more time to respond to comments, but our time is also limited. Extending the comment period would make that time even shorter.

G-7 [submitted by Eleanor Thompson]: Please Close Stericycle, and please work with Breathe Utah as they apply for funding to assist people in replacing wood heat in their homes with natural gas.

Response to G-7: DAQ recognizes the importance of minimizing emissions from woodstoves, and supports the efforts of Breathe Utah with regard to woodstove change-outs. Note that Stericycle is not one of the sources specifically identified in the SIP; however, DAQ will continue to pursue an appropriate resolution to the matter.

G-8 [submitted by Bob Whitehead]: Mr. Whitehead expresses support for strict air quality regulations, including a total ban on wood burning and cleaner fuel even if the latter comes at greater expense.

Response to G-8: DAQ appreciates this input. See response to comment no. A-5.

PM2.5 SIP

PM-1 [submitted by Carl Ingwell, U Student Air Network and Clean Air Now during the SLC public hearing]: People are frustrated that the messaging from UCAIR, the DAQ, the Clear the Air Challenge, etc., is asking people to make cut-backs in their personal lives, while at the same time industry will be allowed to increase its emissions by 12%. We're asking for clean air now, and that will require decreases from mobile, area, and point sources.

Response to PM-1: The commenter is correct that DAQ is asking people to take some responsibility in addressing our air quality problems, but this is not new. Vehicle Inspection / Maintenance programs have been in place since the mid 1980s in counties along the Wasatch Front, and wood-burning restrictions were imposed in the early 1990s. As our population and our vehicle miles traveled continue to increase at a rapid pace it is only appropriate that this responsibility be continued.

DAQ has constructed these SIPs in the manner prescribed by the Clean Air Act, the PM2.5 Implementation Rule, and requirements for the preparation of Implementation Plans in 40 CFR 51.

These guidelines require (among other things) two fundamental elements pertinent here: one, that in making forecasts of emissions throughout the inventory, that we account for growth. Growth, in these plans, applies to: 1) population which affects emissions belonging to area sources and non-road mobile sources, 2) vehicle miles traveled, as well as the sheer number of vehicles, which affect emissions belonging to the on-road mobile source sector, and 3) the economy, which affects emissions from large stationary sources. The Wasatch Front has a growing economy. Also accounted for in the growth of stationary source emissions were any significant permitting actions that took place between 2010, the baseline inventory for the SIP, and the present. We refer to this accounting step as the "true-up."

The second pertinent SIP element is the obligation to evaluate Reasonably Available Control Measures (RACM), available throughout the cross-section of emission sources, including Reasonably Available Control Technology (RACT) as it applies to large stationary sources. RACT was applied to the large stationary sources (see the Technical Support Document for details), and was factored in, after economic growth and true-up, as the final step in the accounting of future emissions. The net result of that three-step process was, as the commenter points out, a 12 % increase in emissions (PM2.5 and all plan precursor emissions) from 2010 – 2019. However, the application of RACT effectively reduced these forecasted emissions by 20.5 % and 17.5 % (respectively) in the attainment year for Salt Lake City and Provo.

The application of this control technology meets the objective of the SIP, whereas the notion of a net emission reduction from any particular sector of the overall inventory is simply not a requirement.

PM-2 [submitted by Christopher Thomas, HEAL Utah]: The Clean Air Act says we should attain the standard by 2014, but this plan does not show that we will until at least 2019. Emission cuts in the plan come overwhelmingly from small businesses, residences and drivers, while at the same time it allows air pollution coming from industry to increase by 12%. In the case of the refineries, the emission controls they will make are not required until 2018, and still they are allowed to expand their production. In order that the plan will actually work, we think it requires deeper and swifter cuts from industrial polluters

Response to PM-2: DAQ agrees that we need cuts from industry in order to show compliance with the NAAQS. The SIP required large industrial sources to undergo a case-by-case RACT analysis which, despite a net growth in that sector, requires emission reductions that amount to roughly 20% in 2019.

Nevertheless, the inventory shows that these air-sheds are dominated by on-road mobile sources. The levels of on-road mobile source emissions in 2014 simply preclude attainment of the NAAQS at that time.

The timing of RACT implementation may seem delayed, but balances practical implementation constraints against the need for Reasonable Further Progress. Please be aware that the types of pollution control technologies industry requires are not “off the shelf”, and a significant lead time is required to design, purchase, install, and implement these technologies. See also the response to comment no. P-1.

PM-3 [DAQ received the same comment from 653 people]: Projections of emissions used in the SIP show that, while emissions are decreasing within the mobile source sector and the area source sector, industrial emissions will be increasing by 12%. Everyone needs to do their part. Please require deeper cuts of those facilities.

Response to PM-3: DAQ agrees that everyone needs to do their part. For a more complete response, please see Comment no. PM-1.

PM-4 [submitted by Diane Menuz]: I am concerned we are only trying to address the single-day values for emissions. There is a distinct possibility that we will be driven to non-attainment for the annual standard, and some of our reductions will only be applicable when air quality values are high. I am also concerned that point source pollution is going to continue to increase in the region. Some of the technology that was considered “not economical” should be reconsidered.

Response to PM-4: Both nonattainment areas violate the 24-hour NAAQS (35 $\mu g/m^3$), and do so seasonally during the winter months. When we began the SIP development process, the annual standard was 15 $\mu g/m^3$, and Utah was in compliance at all stations. In 2012, the annual standard was lowered to 12 $\mu g/m^3$, and even at this level, all of Utah's stations are in compliance. Also encouraging is that the annual PM2.5 values continue to trend downward.

Perhaps more importantly, the character of the PM2.5 differs from winter to summer. It is during winter when atmospheric conditions are suitable to drive the chemistry necessary to create the secondary ammonium nitrate that so dominates the filter samples we collect during episodes of high PM2.5 concentration. For this reason, much of the control strategy is directed at precursors to secondary PM2.5. Although these strategies won't help directly during summer months, the mitigation of peak 24-hour concentrations will also reduce the annual values.

PM-5 [submitted by Don Jarvis during the Provo public hearing]: It makes sense to have measures that are more stringent during extreme air conditions rather than try and prepare for extreme air conditions 365 days a year, which we certainly don't have.

Response to PM-5: The commenter is correct in that neither nonattainment area is in violation of the annual standard for PM2.5. While most controls cannot simply be turned on and off, Utah does manage the wood-burning program in a way that targets days when PM2.5 is elevated. There are also a number of stationary sources required to switch to cleaner fuel sources during winter (November – February) when we are most likely to exceed the PM standards.

PM-6 [submitted by HEAL Utah]: The SIP falls short of what it could and must be. To elaborate:

1) Until quite recently, DAQ indicated it wasn't sure there would be enough emission reductions to show attainment in 2019. The gap was large. Now, largely because of a shift in baseline years, the SIP does show attainment in 2019, but there is a strong chance that the "true baseline" gives the plan much less chance to succeed. Utah could find itself scrambling, sooner rather than later, to identify additional cuts. Deeper cuts in emissions now would provide more assurance that public health would be protected and highway finding would not be jeopardized. The costs of these emission cuts could also be spread out over more years.

2) Looking at the emission projections built into the plan, by sectors of the inventory, reveals the following: the transportation sector will produce significantly fewer emissions at the end of the decade, due in large part to the federal Tier 2 emission standard and also to the on and off-road low-sulfur diesel rules. Area sources also will account for fewer emissions. Industry, however, is projected to emit 12% more of the pollutants addressed by the plan. Even though the industrial source sector is significantly smaller than the area-source or mobile source sectors, these emission gains are substantial enough so as to significantly offset the pollution control reductions the Division has worked so hard to identify and implement. The easiest way to improve the SIP is to require deeper cuts from point sources.

3) There are specific pollution controls that can and should be required of point sources by 2019. Generally, the Division often uses the terms BACT (Best Available Control Technology) and RACT (Reasonably Available Control Technology) interchangeably. These are distinct standards, and each requires its own process. Our initial review leaves us unconvinced that the Division has in all cases verified the application of RACT, but we are certain that all of Utah's point sources have not gone through a rigorous BACT analysis. We do believe that Utah will soon be required to prescribe BACT in any nonattainment area reclassified as "serious" under subpart 4 of the Clean Air Act. This provides all the more reason that any technologies that are close to RACT should be ordered and implemented as soon as possible. Specifically, at its petroleum refineries Utah should require additional controls at the Fluidized-Bed Catalytic Cracking Units(FCCUs) to reduce NOx, PM, SO2 and VOC, as well as ordering BACT levels of control at heaters, boilers, cooling towers, flares, compressor engines, SRUs cogeneration units and for equipment leaks.

As examples, the consultant hired by DAQ to evaluate RACT noted that Big West should consider selective catalytic reduction at its FCCU. Doing so could reduce NOx emissions by about 40 tons per year (tpy) at a cost of about 20,000 $/ton, which is in line with other RACT reductions the Division has ordered. Also suggested by the contractor, Chevron could limit its NOx emissions at three of its boilers, thereby cutting emissions by 110 tpy at 11,000 $/ton.

Response to PM-6 Point 1) DAQ appreciates the suggestion, and would agree that there is a strong possibility of having to re-evaluate emission controls due either to a failure to attain by the attainment date or because of a bump-up in classification to serious under the "Subpart 4 ruling". DAQ understands that under Subpart 4, the benchmark for controlling large stationary sources would be Best Available Control Technology (BACT), not Reasonably Available Control Technology (RACT) as is required under Subpart 1. Nevertheless, the distinction is not pronounced, and throughout the exercise DAQ was aware that: 1) BACT is routinely required in all NSR actions, and 2) it would be very difficult to show attainment, even in 2019. EPA's Implementation Rule, under Subpart 1, makes it clear that where it is difficult to show attainment, or where it becomes necessary to request an extension of the attainment date, the definition of what is "Reasonable" shifts to a selection of control technologies with a higher $/ton threshold. As a result, we believe that the collection of control technologies that is included in the SIP goes beyond what would generally be regarded as RACT, and in most cases meets BACT.

Having said that, the commenter is still correct that Utah could find itself once again having to ensure that adequate technology is in place at the large stationary sources. However, that assessment would come as part of the next step in a process that allows for continuing redress with regard to Utah's air quality problems.

Response To PM-6 point 2) See responses to comments no. PM-1 and PM-2.

Response To PM-6 point 3) Beyond the general discussion addressed under point no. 1, the commenter identifies some specific examples.

Big West - To explain why DAQ evaluated the numbers the way it did: 1) We looked here at the prospective reduction in actual emissions (26 tpy), not potential emissions (40 tpy). This led to a much higher $/ton figure. Also, Big West can meet the NOx requirement of Subpart Ja using a low-NOx catalyst. This is the same standard required of the other refineries.

Chevron – DAQ agrees that NOx control at these three boilers is appropriate, and Chevron will make the necessary reductions.

PM-7 [submitted by Nucor Products Divisions]: Utah's approach regarding the SIP is flawed for the following reasons: 1) In order that DAQ identify VOC reductions as a control strategy, EPA requires the state to make a demonstration showing that VOC emissions significantly contribute to PM2.5. We do not believe that DAQ has provided an appropriate technical demonstration showing as much. 2) While we understand that Box Elder County lies within the boundaries of the nonattainment area, the majority of the actual contributions come from Salt Lake, Davis and Weber counties. Thus, the strategy to reduce VOC emissions from point sources in Box Elder County has not been shown by DAQ to be necessary. We do not believe that a 10% reduction in our potential to emit VOC will have any measurable effect on air quality. Industry as a whole contributes only 11% to the total problem, and DAQ has failed to address other sources of PM2.5 and focuses only on VOC. 3) While reducing emissions of ammonia from agricultural sources would be difficult and unpopular, we believe that the state should focus on reduction strategies that would have a greater impact on PM2.5 than VOC controls.

Response to PM-7: DAQ does not feel that a control strategy based on VOC and primary PM2.5 emissions reductions is done arbitrarily. Our assessment of the ammonia inventory in Box Elder and Cache counties, where there is significant agricultural activity, indicates that the level of ammonia reduction needed to affect the formation of ammonium nitrate would not be feasible. For this reason, ammonia was not identified as a plan precursor to PM2.5 with the attendant need for emission controls.

The SIP strategy does include controls on PM2.5 and each of the identified plan precursors, including SO_2, NOx, and VOC. Every stationary source in the nonattainment area, with the potential to emit any of these pollutants in the amount of 100 tons per year, was evaluated with respect to RACT for each of these pollutants.

VOC plays a role in the formation of nitric acid primarily through reactions during the day when ambient levels of VOC contribute to ozone chemistry. One of the by-products of ozone chemistry enhances nitric acid formation during the daytime. This is important because it is nitric acid that reacts with ammonium to form ammonium nitrate. For this reason we seek to limit VOC emissions so that the daytime/ozone pathway to nitric acid will be reduced.

Please see sections 1.3 titled "Observational Analysis of NOx – VOC Chemistry" and 1.6 titled "Additional Modeling: Utah NOx -VOC Chemistry in CMAQ" of the Weight-of-Evidence TSD for discussions on NOx and VOC chemistry and how it relates to secondary particulate nitrate production (http://www.airquality.utah.gov/Pollutants/ParticulateMatter/PM25/SaltLakeProvo/docs/tsd/chapter4/4_e_WeightofEvidence_TSD_09192013.pdf) . Section 1.6 describes model sensitivities performed to examine the benefits of reducing NOx and VOCs for the emission inventory years of 2008, future year 2014, and future year 2019. The model sensitivities show that reducing VOC emissions lead to a reduction of secondary particulate nitrate in all three (2008, 2014, 2019) modeling years.

PM-8 [submitted by Kennecott Utah Copper, LLC (KUC)]: The Projected emissions for KUC's Bingham Canyon Mine are presented in Table 6-3 on pages 53-54 of Section IX.A.21 of the proposed SIP. This table does not represent correct emission projections for the years 2014, 2017, and 2019. It is KUC's understanding that the errors in the projected emissions have been corrected and will be reflected in future modeling and SIP analysis.

Response to PM-8: DAQ is continuing to refine the numbers used in the SIP modeling and reported in the SIP narrative and TSD. Any corrections will be identified as the final SIPs are brought back to the Air Quality Board for final adoption. In the case of the projected emissions from the mine, Table 6-3 will be revised as follows:

	2010 Baseline (R2)					2014 (R43)				
Site Name	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Kennecott Mine Concentrator	0.65	8.49	0.50	0.00	0.01	0.85	12.13	0.65	0.00	0.01
	2017 (R2)					2019 (R49)				
	PM2_5	NOX	VOC	NH3	SO2	PM2_5	NOX	VOC	NH3	SO2
Kennecott Mine Concentrator	0.85	12.13	0.65	0.00	0.01	~~0.85~~ 0.90	~~12.13~~ 14.33	~~0.65~~ 0.78	~~0.00~~ 0.01	~~0.01~~ 0.02

As a final note, this correction was anticipated in advance of the proposal incorporating SIP limits. Therefore, Part H.12, as proposed in October, is reflective of this correction.

PM-9 [submitted by DIA Managers and Eagle Mountain City, also the "Associations"]: The PM2.5 SIP, as proposed, will make it extremely difficult, if not impossible, for major manufacturers and industrial facilities to locate to Eagle Mountain. It represents a definite blow against the City's current General Plan and Economic Development Plan. To elaborate, any major new source of emissions would need to acquire "emission offsets" to obtain a permit from the DAQ. In fact, aware of this requirement, one such prospective source did purchase emission offset credits, including credits for PM2.5. However, DIA Managers and Eagle Mountain are now being told that the proposed industrial facility cannot use the credits it has obtained, and that few if any other credits may be available for Utah County industrial facilities. The proposed SIP does nothing to alleviate this problem. Specific EPA guidance on the subject allows the use of "older", or banked, emission credits. Appendix S of 40 CFR 51 states that "the reviewing authority may allow offsets that exceed the requirements of reasonable progress toward attainment (Condition 3) to be "banked" (ie, saved to provide offsets for a source seeking a permit in the future") for use under this ruling." This guidance further explains that the "reviewing authority may allow these banked offsets to be used under the pre-construction review program required by Part D, as long as these banked emissions are identified and accounted for in the SIP control strategy." DIA Managers and Eagle Mountain City request that DAQ modify the proposed SIP to identify and account for sufficient PM2.5 emission offset credits for the development of the proposed industrial facility, as well as other economic development in Eagle Mountain. Such modification might include the identification of an "economic development zone" as discussed in a recent EPA proposed rule entitled "Implementation of the 2008 NAAQS for Ozone State Implementation Plan Requirements," (78 FR 34,178). If no such action is taken, it is possible that economic development along the Wasatch Front could be hindered until such time as additional PM2.5 offset credits are developed. This could take many years.

Response to PM-9: DAQ is aware of the economic constraint that will result at the completion of these PM2.5 SIPs. Emission offsetting requirements represent an element of the federal Nonattainment New Source Review (NSR) rules that are required in any nonattainment area. These permitting rules apply to new major sources as well as major modifications to existing major sources.

The concept of banking and offsetting, as the commenter points out, is to allow the creation emission credits if the improvements in air quality are beyond what is required for making reasonable progress toward attainment of the standard. The reference point for this measurement is the baseline used in constructing the SIP. It corresponds to a time when the area is not attaining the standard. For this reason, pre-existing emission credits that were in the bank but not the airshed cannot be "withdrawn" for permitting purposes without compromising Reasonable Further Progress (RFP) unless they are explicitly introduced into the modeled attainment demonstration such that RFP is still preserved. This is what EPA is speaking to in the second point referenced in the comment.

DAQ has constructed SIP revisions in the past that were able to identify and account for the emission credits existing in the registry. This has enabled the New Source Review process to accommodate economic growth thus far. Unfortunately, with a standard as difficult to attain as this 2006 24-hour PM2.5 NAAQS, we find there is simply no room to introduce these emission credits and still demonstrate Reasonable Further Progress toward attainment, even with the maximal 5-year extension to the statutory attainment date.

The commenter makes an interesting suggestion with regard to economic development zones. Perhaps this can be explored in the future as a possible SIP revision, although we would point out that staff attempted as with regard to the modeling of growth in vehicle miles traveled for

Utah County (by locating that growth in near Eagle Mountain), and identified no benefit at the Lindon monitor.

DAQ did consider, during the SIP development process, the idea of also imposing an offset requirement for minor sources and minor modifications. This would have been over-and-above what is required by the federal Nonattainment NSR. In fact, a group of stakeholders was convened to discuss this very issue. As a result of that process, DAQ ultimately chose not to introduce this additional constraining. One of the considerations that support this decision was to avoid the unintended consequence of not allowing sources to modernize, which often results in improvements in efficiency and, consequently, fewer emissions on a production basis.

PM-10 [submitted by Utah Manufactureres Association, the Utah Mining Association, and the Utah Petroleum association; collectively the "Associations."]: UDAQ has not presented a time-table of effective dates for implementation of the SIP. Additional clarification around this schedule is requested.

Response to PM-10: DAQ offers the following as its own interpretation. This does not preclude EPA from interpreting things differently:

December 4, 2013 – SIP (presumably) approved by the Utah Air Quality Board

December 5, 2013 – SIP becomes Utah state law

- At this point, any permitting action involving a new major source or a major modification to an existing major source would need to consider any offsets required to secure a construction permit (Approval Order) in light of the date these offsets were "banked" and be aware that these PM2.5 SIPs establish a relevant deadline for the use of any banked PM2.5, SO_2, NOx, or VOC. The baseline used as a reference point in these SIPs was 2010.

December 14, 2013 – SIP submitted to EPA

January 8, 2014 – Part H (presumably) approved by the Utah Air Quality Board

January 9, 2014 – Part H becomes Utah state law

- At this point, the any deadlines associated with the implementation of any control technologies required by the SIP become enforceable. Sources needing a permit to construct (Approval Order) should consider the timing of the particular project.**Bill 16-2**

PM-11 [submitted by the Associations]: We are concerned that the SIP will significantly affect future permitting and the potential for economic growth within the nonattainment area. The SIP does not provide adequate clarity regarding how modifications and offset requirements will affect the permitting process following implementation of the SIP. The SIP should expressly provide that certain SIP provisions will not apply unless and until EPA takes action to approve the SIP. This is especially true with respect to the offsetting requirements under major nonattainment NSR. Sources should be able to continue to utilize reductions for offsetting in the same manner as they are currently allowed to do until such time as EPA takes action to approve the PM2.5 SIP.

Response to PM-11: DAQ understands the concern expressed by the commenter. In the response to comment no. PM-10, we provide our interpretation as to when the circumstances surrounding the offsetting element of any major source nonattainment area permitting action (as required under federal law) would change.

The commenter seems to be asking DAQ to exercise some discretion in delaying the change in this circumstance, but this amounts to discretion that DAQ does not believe that it has. As a "SIP state" Utah has been delegated the authority to enact and enforce federal regulations as they apply to air quality. DAQ interprets this mandate to act as the federal agent in these matters. Enforcement of a State Implementation Plan falls into this category, even if EPA has taken no official action to approve Utah's state laws into the Utah SIP.

PM-12 [submitted by the Associations]: Under the current version of the SIPs it may be extremely difficult, if not impossible for many sources to obtain the required emission offsets. The state should modify the proposed SIPs to address this problem.

Response to PM-12: See response to Comment no. PM-9.

PM-13 [submitted by the Associations]: Federal regulations (40 CFR 51.1010) prescribe the requirements for RACT and RACM in PM2.5 nonattainment areas. The regulations require that the state submit, with the attainment demonstration, a SIP revision demonstrating that it has adopted all reasonably available control measures (including RACT for stationary sources) necessary to demonstrate attainment as expeditiously as practicable and to meet any reasonable further progress (RFP) requirements. The Associations feel that the state has stretched the regulatory requirement for RACT beyond its regulatory definition and is demanding more stringent BACT in many cases. Economic feasibility of the controls is to be considered in either case, however, the controls prescribed in the SIP for point sources and area sources is expected to cost industry as much as $25,000 and $6,500 per ton respectively. These costs exceed prior pollution control requirements implemented by DAQ under either RACT or BACT.

Response to PM-13: DAQ is aware that the costs associated with reductions in emissions are higher than one might associate with "Reasonably" available control technology, and perhaps even higher than what has become associated with the "Best" available controls commonly required as part of New Source Review. However, the current 24-hr PM2.5 standard proves very difficult to attain given Utah's topography and winter climate. EPA makes it clear that, in determining the economic feasibility of a potential RACT measure, the attainment needs of the area should be considered. Given the attainment needs of the Salt Lake City and Provo nonattainment areas, DAQ believes that the range of costs for the control measures and technologies included in the SIP strategies are, in terms of $ per ton reduced, entirely justifiable from the standpoint of RACT. We further believe that, when those costs are considered and the technologies are examined, the SIP strategies could also be justified as meeting BACT in most cases. See also responses to comments no. PM-6 point 1 comment no. P-2.

PM-14 [submitted by the Associations]: As part of SIP development, UDAQ requested emissions data concerning condensable PM2.5. There is only so much data available from these industries, and we recommend that the limits of this database be considered in advance of setting policies or making regulations to be included in the SIP. The Associations agree with the language pertaining to flexibility in stack test methods authorizing "other EPA-approved testing methods acceptable to the Director." Some of these alternative testing methods involve the measurement of condensable PM2.5 emissions.

Response to PM-14: DAQ agrees. Thank you for your comment. Aside from the limits of this data, DAQ is aware of several other mitigating factors that call for caution in the use of this data. Some of these concerns are as follows:

Method 202 was revised about three years ago. Given that stack tests are often required every three or five years there does not yet exist a data set including at least one test result for every facility.

Method 202 prescribes a temperature at which the stack gasses are ultimately condensed. However, there are several different methods in use to obtain the front-half (filterable) catch prior to condensation. Each of these federal reference methods employs a different temperature. Therefore, not even all Method 202 tests are comparable to one another.

- Other variables in tests conducted over the years make even the older data difficult to interpret.
- The compounds condensed in the back-half are often already regulated as other criteria pollutants (sulfates, nitrates, and organics).

The federal rules for PM2.5 implementation require (at 40 CFR 51.1002) that, for the purposes of establishing emissions limits under 51.1009 and 51.1010 [RFP and RACM], States must take into consideration the condensable fraction of direct PM2.5 emissions. Part of that consideration is given to the items mentioned above.

Bill 16-7

PM-15 [submitted by the Associations]: The numerical emission limits in the proposed SIP identify the industrial sources by name. This approach for naming specific facilities is not consistent with earlier statements made by DAQ. We recommend that the SIP be clarified to differentiate the facility operations from the company names to enable flexibility for the businesses with respect to requirements documented in the SIP regulations.

Response to PM-15: DAQ acknowledges that it was our stated intention to remove named sources from the SIP. However, it became apparent that the time it would take to generically capture the uniqueness of each of the large point sources in the nonattainment areas was time that was not available to us.

PM-16 [submitted by the Associations]: Certain Associations' members have noted that the emissions identified by DAQ for use in the attainment demonstration were not correctly incorporated into the modeling and proposed SIP. We have also noted inconsistencies between the TSD and the SIP, and even within the TSD itself (e.g. inconsistencies between TSD Sections 3.b.ii and 5.c.i). We understand that DAQ is continuing to make refinements in the modeling inputs. It will be important that the final attainment demonstration and Part H limits are consistent.

Response to PM-16: DAQ shares this concern and has in fact been making such corrections to the proposed SIP.

PM-17 [submitted by submitted by Physicians for a Healthy Environment, Friends of Great Salt Lake, CleanAirNow!, The U. Student Clean Air Network and Western Resource Advocates; collectively "Utah Physicians"]: In order to establish the basis for an extension of the attainment date, an assessment must be made with regard to tighter regulation of wood smoke.

Response to PM-17: DAQ has attached a very high level of control to the estimate of wood smoke emissions on would-be "red days" in the SIP. We claim a "ramp-up" to 95% control in 2019 (from 90% in 2014), and commit to enhancing the enforcement element of the program. This is already very aggressive, and it is unlikely the EPA would award any additional credit. Nevertheless, recent information shows that while compliance with our wood burning program is already very good, there is still room for improvement.

PM-18 [submitted by Utah Physicians]: The SIP does not address the issues raised by EPA regarding the PM10 SIP. Referenced is a letter from Governor Herbert to EPA dated October 7, 2011. The letter itself references EPA's December 1, 2009 proposal to disapprove Utah's proposed maintenance plans for PM10.

Response to PM-18: DAQ has in fact resolved many of the issues surrounding those proposed plans. Indeed, many of the issues were specific to the modeling analysis underlying those plans, and emission limitations for the stationary sources identified therein. These of course are no longer pertinent, having been replaced in DAQ's current proposal. Two of the more notable issues that have been resolved here are flaring emissions at refineries and the treatment of banked emission credits in the attainment demonstration.

PM-19 [submitted by Utah Physicians]: Air quality near the refineries: Nowhere in the SIP is there any acknowledgement of or accounting for the increase in diesel emissions from hundreds of truck trips bring in black was crude substrate for the refinery expansions.

Response to PM-19: DAQ agrees that no specific line item labeled "truck diesel emissions" appears under the individual refinery RACT analyses. Similarly, no such line item will appear in the individual emission inventories for any of the refineries – either in the "true-up" baseline or in any of the projection year inventories (2014, 2017 or 2019). The reason for this is that these emissions do not belong to and cannot be associated with a particular refinery.

First, the vehicle exhaust, or what is known as "tail pipe emissions" are the concern of the owner of the vehicles, and not the individual refinery which happens to receive the crude oil delivery. As a source, the refinery is not responsible for the care and maintenance of those vehicles.

Under the permitting structure of the Clean Air Act the refineries are considered stationary sources, and as such are regulated under Title I of the Act. Vehicles are considered mobile sources, and are regulated under Title II of the Act. Similarly, under the SIP, mobile sources are separated from point and area sources in RACT/RACM analyses and treatment within the attainment demonstration.

Growth in on-road mobile vehicle emissions – including that from truck traffic – is estimated by the metropolitan planning organizations and is included in the emissions inventories that the MPOs submit to DAQ for use in SIP air quality modeling.

PM2.5 SIP/RACT

PM-20 [submitted by Physicians for a Healthy Environment, Friends of Great Salt Lake, CleanAirNow!, The U. Student Clean Air Network and Western Resource Advocates; collectively "Utah Physicians"]: Subpart 4: D.C. Circuit Court of Appeals, in January 2013, remanded the PM2.5 implementation rules to EPA such that they would conform to Subpart 4 of the CAA (Additional Provisions for Particulate Matter Nonattainment Areas, sections 188 – 190) rather than the more general Subpart 1 (Plan Requirements for Nonattainment Areas, sections 171 – 179).

- SIPs for moderate areas under Subpart 4 were due June 14, 2011. They are therefore 2&1/2 years late, and failure to implement them on time represents a lost opportunity to initiate the initial steps toward attaining the NAAQS.
- RACT to be implemented no later than 4 years after the area was designated nonattainment (December 14, 2009). This would be December 14, 2013.
- Attainment date no later than the end of the sixth calendar year after designation. This means the attainment date is really December 14, 2015. The proposed SIPs fail to show attainment by this date.

Response to PM-20: DAQ is aware that the courts have made this determination. It may be easy to say, in hindsight, that DAQ did not comply with deadlines that were not even specified when Utah's nonattainment areas were so designated. And it may be easy to say that the SIPs should simply now be built to the specifications of Subpart 4, even though EPA's implementation rule pointed only to Subpart 1. DAQ would remind the commenter that these are plans that have been almost seven years in the making.

Yes, the SIPs are late, even by Subpart 1 deadlines, and it is possible that not all RACT will have been implemented by December 14th of this year. Most importantly, the modeling analysis in the proposed SIPs shows that we will certainly not meet attainment by the end of 2015 (though Section 189 offers such an outcome as still satisfying the plan provision requirements for a moderate area).

DAQ is as anxious as anyone to see meaningful improvement in air quality. And this is why it is important to get these SIPs approved now rather than waiting until EPA interprets Subpart 4 in a new implementation rule for PM2.5.

It is almost a certainty that each of these nonattainment areas will be re-classified as a "serious" nonattainment area, but for now, even under Subpart 4 they would both be classified as "moderate." The SIP requirements for moderate nonattainment areas under Subpart 4 are actually not much different than what was ostensibly required under Subpart 1.

For these reasons, DAQ intends to submit these SIPs to EPA in an effort to meet the Subpart 4 moderate area planning requirements. The timing of this submittal will obviously be absurd with respect to the schedule outlined in Subpart 4, but it represents a significant step in the right direction. Furthermore, EPA seems inclined to work with us in supplementing this submittal to meet the remainder of these alternate requirements.

Ultimately there will be a new planning requirement, and in order to meet the additional rigors of serious area nonattainment, improvements will have to be made to these plans. Nevertheless, much of what will be required is put into place by these plans.

PM-21 [submitted by Utah Physicians]: Extension of attainment date: SIP says 2019, but does not show that there are absolutely no reasonable control measures that would bring the areas into attainment sooner than that. As stated before, the attainment date, under Subpart 4, is really December 14, 2015. The SIP must show that no reasonable measures are available that could be implemented to attain the NAAQS one year earlier than that. Under EPA's guidance for PM2.5 implementation (under Subpart 1), RACT and RACM take on added significance where a state determines it cannot attain the NAAQS in 5 years. It states that "EPA will not grant an extension of the attainment date beyond the initial 5 years required by section 172(a)(2)(A) for an area if the State has not considered the implementation of all RACM and RACT local control measures for the area."

Response to PM-21: As anyone who has followed the development of these plans knows, it has been very difficult to show attainment of the standard, even with the maximum 5-year extension allowed under Subpart 1 of the Act (see Comment no. PM-6). Furthermore, most of the controls evaluated as part of the RACM/RACT analysis that were determined to be technologically feasible were ultimately adopted as part of the SIP control strategy. The collection of potential controls that were not retained as part of the strategy (along with a conservative assumption of 0% growth for industry) were then tested in the air quality model to determine whether it would be possible to advance the attainment date forward. This analysis is discussed in Section 5.c.i of the Technical Support Document and concludes that it is not possible.

PM-22 [submitted by Utah Physicians]: The SIP could have required implementation of the identified RACT measures sooner than 2019 or 2017.

Response to PM-22: The timing of RACT implementation may seem delayed, but balances practical implementation constraints against the need for Reasonable Further Progress. See also response to comment no. PM-2.

PM-23 [submitted by Utah Physicians]: More controls should have been required at the industrial sources that were evaluated, particularly the refineries.

Response to PM-23: DAQ disagrees. The control technologies ultimately retained as part of the SIP strategy meet a definition of "reasonably available" that implies costs more generally imposed to meet "best available" controls.

PM-24 [submitted by Utah Physicians]: The stationary source RACT is inadequate in lowering the threshold for source evaluation from 100 tpy to 70.

Response to PM-24: DAQ disagrees. The PM2.5 implementation rule specifically notes that Section 172 of the Act does not include any specific applicability thresholds to identify the size of sources that States and EPA must consider in the RACT and RACM analysis. Section 189 of Subpart 4 is silent on the matter for moderate areas, and for serious areas identifies 70 tons per year only as the threshold for identifying a "major" source (of PM10) for purposes of permitting.

PM-25 [submitted by Utah Physicians]: The SIP should consider implementing RACT that does not allow industry to increase. Instead, the SIP allows industry to grow by 12% by 2019.

Response to PM-25: See response to comment no. PM-1.

PM-26 [submitted by Utah Physicians]: In determining an appropriate cost effectiveness associated with the RACT measures, the SIP does not differentiate between PM2.5 and precursors to PM2.5.

Response to PM-26: DAQ did not seek to establish a separate price range for each pollutant. It is a consideration recommended by EPA, but ultimately not a required element of a RACM analysis.

PM-27 [submitted by Utah Physicians]: SIP does not show Reasonable Further Progress because it does not require RACT until 2017 and 2019.

Response to PM-27: DAQ disagrees. Tables 8.1 (in each SIP) chart "generally linear progress" toward attaining the standard between the base year and the attainment date. This progress is shown for PM2.5, each of the plan precursors, the aggregate of plan precursors, and for the total of all pertinent emissions. Perhaps more importantly, the requirements for making this showing also allow for emission levels "projected to result in a generally equivalent improvement in air quality." Tables 8.1 also show that projected concentrations of PM2.5 to be meeting this test.

MOBILE SOURCE COMMENTS

MOB-1 [submitted by submitted by submitted by Physicians for a Healthy Environment, Friends of Great Salt Lake, CleanAirNow!, The U. Student Clean Air Network and Western Resource Advocates; collectively "Utah Physicians"]: Utah Physicians comments that DAQ did not include a complete analysis of potential reasonably available control measures (RACMs) for on- and non-road mobile emission sources and, therefore, the RACM analysis is for mobile sources is deficient.

Examples of reasonable measures suggested by Utah Physicians for *non-road* mobile equipment include diesel oxidation catalysts (DOCs), diesel particulate filters (DPFs), engine replacements and upgrades, NOx retrofits and best available controls on cargo handling equipment. In addition, UTAH PHYSICIANS expressed concern with the statement in the TSD that DAQ "did not consider any SIP controls for off-road mobile sources beyond those already promulgated at the federal level." Examples of reasonable measures suggested by UTAH PHYSICIANS for *on-road* mobile equipment include diesel retrofits for school buses and NOx retrofits, enhanced inspection and maintenance programs in Box Elder and Tooele counties, vapor recovery systems at fueling stations, elimination of long duration truck stop idling, traffic management and incentive programs, and MPG and emission requirements for large fleets. Finally UTAH PHYSICIANS is unsatisfied with the documentation of the discussion and analysis of a potential control measure that involved reducing the Reid vapor pressure (RVP) of gasoline that was identified in a previous version of the SIP.

Response to MOB-1: DAQ currently provides grants and loans for diesel retrofits -- including DOCs, DPFs, engine replacements/upgrades, and NO_x retrofits for on- and non-road diesel equipment **–** through the Utah Clean Diesel Program and the Utah Clean Fuels and Vehicle Technology Grant and Loan Program. Examples of measures accomplished through the Utah Clean Diesel program include: the retrofit of 1,200 diesel-powered school buses throughout the state and the replacement of 27 older school buses with new buses that meet more stringent emissions standards; the installation of auxiliary power units (APUs) on 52 long-haul trucks to reduce long-term idling; the installation of APUs on 32 farm trucks and partial funding to repower and replace 31 pieces of diesel farm equipment; repowering trucks used as snow plows during the inversion season to run on compressed natural gas engines; and replacement of large construction equipment. Because funding for these programs is variable and dependent on State and federal appropriation beyond the control of the Utah Air Quality Board, DAQ cannot claim emissions reduction credit for similar future projects that may occur during the SIP compliance window. However, such measures will likely help the State in demonstrating attainment with the PM 2.5 NAAQS.

The statement identified from Page 5.d – 1 of the TSD that "UDAQ did not consider any SIP controls for off-road mobile sources beyond those already promulgated at the federal level," was not representative of the process DAQ undertook for evaluating non-road control measures. Several potential non-road controls were considered, but none were identified that were creditable in the SIP. In particular, the State is pre-empted from setting its own engine standards for non-road equipment. Remaining options for the State to affect this source category are mainly limited to incentive programs such as those currently offered and outlined above. Without the availability of committed ongoing funding for such incentive programs, these measures are not creditable in the SIP. For that reason, Page 5.d – 1 of the TSD will be changed to more closely align with Section 6.6 of the SIP, which states, "Beyond the existing controls reflected in the projection-year inventories and the air quality modeling there are no emission controls that would apply to this source category."

Vehicle inspection and maintenance programs were initially considered for the non-attainment portions of Box Elder and Tooele counties, but were ultimately not included in the SIP as noted in the TSD:

> DAQ also tested the inclusion of the above I/M programs in both Box Elder and Tooele counties within the Salt Lake nonattainment area. However, photochemistry model sensitivity runs revealed that the effect of these controls on PM2.5 concentrations at the controlling air monitor located at Hawthorne Elementary School (1675 South 600 East in Salt Lake City, Utah at an elevation of 1306 m or 4285 ft) was negligible. Therefore, the effectiveness of an I/M program was not included in the modeling in either of these counties. However, I/M programs already exist in Salt Lake, Davis, Utah, and Weber counties and are reflected in the inventories.

In addition, it is important to emphasize that only portions of Box Elder and Tooele counties were designated non-attainment for PM 2.5. Developing an I/M program for only a fraction of these counties would have been administratively difficult and costly. Furthermore, the vehicle miles traveled (VMTs) from vehicles located in the non-attainment portions of these counties represent only a tiny fraction of total VMTs in the Salt Lake non-attainment area. For all of these reasons, DAQ did not pursue an I/M program in these counties.

The State of Utah already requires Stage I vapor recovery systems at fueling stations to capture emissions from underground storage tanks and route them back to tanker trucks during the process of unloading gasoline at fueling stations. The State does not require Stage II vapor recovery systems at fueling stations since the function of Stage II vapor recovery systems is already handled by onboard refueling vapor recovery (ORVR) systems that are mandated for all new vehicles. Because Stage II vapor recovery systems are functionally redundant, EPA is currently working to phase-out these systems in favor of ORVR as signaled by a notice of final rulemaking determining that ORVR systems are in widespread use throughout the motor vehicle fleet that was published in the Federal Register on May 16, 2012 (77 FR 28772). EPA has since issued guidance to states on how to develop and submit an approvable SIP revision to remove/phase-out Stage II vapor recovery programs.

With regard to large fleet fuel economy, DAQ is pre-empted by the Federal government when it comes to establishing MPG requirements as suggested by the commenter.

Under the Utah State Implementation Plan Section XII, Transportation Conformity Consultation, the metropolitan planning organizations (MPOs) such as the Wasatch Front Regional Council (WFRC) and the Mountainland Association of Governments (MAG) are the lead agencies for developing transportation control measures (TCMs) such as traffic management programs "… to be considered in the development/review of draft or revisions to the SIP, if necessary." To-date, the non-attainment area MPOs have declined to develop TCMs for inclusion in the SIP. However, the MPOs have supported numerous traffic management measures aimed at reducing congestion and air emissions. Since the emissions reductions associated with these measures are already accounted for in the emissions inventories provided by the MPOs for the SIP, including and claiming credit for these measures as TCMs in the SIP would result in double counting of emissions reductions.

With regard to the consideration of a reduction in the Reid vapor pressure (RVP) or volatility of gasoline as a PM 2.5 emissions control measure, DAQ's preliminary analysis using MOVES default fuels indicated that an emissions reduction may be achievable using this measure. However, when the default fuels were updated with actual fuel specifications for the non-attainment counties, the resulting changes in emissions were less promising. More importantly, it was the consensus of those evaluating the measure that the MOVES model likely overestimates emissions reductions associated with decreases in fuel volatility in the low temperature conditions likely during inversion events. For these reasons, DAQ opted not to pursue RVP reduction as a control measure for the SIP.

MOB-2 [submitted by Mark D. Larsen]: Mr. Larsen wanted clarification about who develops and implements the local transportation plans. He also made the suggestion that the board should include a larger tax credit for electric vehicles to be part of the PM2.5 SIP.

Response to MOB-2: The local metropolitan planning organization (MPO) and the Utah Department of Transportation collaborate in developing the Transportation Improvement Program (TIP) and Regional Transportation Plan (RTP). We have noted your request to increase the tax credit for electric vehicles and encourage you to contact your legislators to make the suggested changes to the tax credit.

MOB-3 [submitted by William Muhs]: Mr. Muhs suggested that the Air Quality Board mandate that Weber County implement a diesel emission testing program.

Response to MOB-3: We have noted your comment and are currently exploring ways to address diesel emissions including emission testing for OBD compliant diesel vehicles and enhancing the counties smoking vehicle programs.

MOB-4 [submitted by Gerald Larsen]: Mr. Larsen opposes the use of congestion pricing to reduce peak travel and reduce emissions. Mr. Larsen notes that many cannot avoid traveling during peak periods, and that congestion pricing amounts to a punishment for these drivers. Mr. Larsen also notes that congestion pricing could have unintended consequences by shifting road use patterns, stymying business deliveries, and tourism. Mr. Larsen also opposes mandating transponders in vehicles.

Response to MOB-4: DAQ is not proposing the use of congestion pricing or vehicle transponders in the proposed SIP.

MOB-5 [submitted by Melanie and Kevin Pfister]: The Pfisters feel that the SIP should include mandatory conversion of public transit vehicles in nonattainment areas from diesel to CNG; mandatory replacement of state, city, and county diesel vehicles with gasoline or CNG vehicles in nonattainment areas; and closure of drive-through windows in nonattainment areas on yellow and red days with a “pay to pollute” option set up to fund diesel conversions/replacements and wood furnace/stove replacement.

Response to MOB-5: Recent analysis of bus and other heavy-duty engine emissions comparing the most up-to-date diesel and CNG engines reveals no emissions reduction benefit from switching to CNG. In fact, some analysis has shown slightly higher NOx emissions from CNG engines compared to modern diesel engines with exhaust controls. It is more important to focus on cleaning up older diesel engines, which can be done via exhaust and crankcase retrofits and repowers or replacements with modern diesel or CNG engines. For this reason, the State of Utah uses a fuel- and technology-neutral approach to cleaning up older diesel vehicles via the Utah Clean Fuels and Vehicle Technology Program and Utah Clean Diesel Program. Closure of drive-through windows may require a statutory change in Utah State Code 41-6a-208 (3)(c) by the Utah State Legislature.

MOB-6 [submitted by Wasatch Front Regional Council (WFRC): On page 61, section 7.5, line 18, the word "budgets" should be replaced with the word "inventories."

Response to MOB-6: On page 61 section, 7.5 line 18, the word "budgets" will be replaced with the word "inventories."

MOB-7 [submitted by WFRC]: On page 62, section 7.7, lines 13, 20, 23, and 26, the reference to the "Salt Lake City, UT Nonattainment Area" should be consistent. The current draft alternates between that phrase and WFRC.

Response to MOB-7: On page 62 section 7.7, lines 13, 20, 23, and 26 will be changed to reflect "Salt Lake City, UT Non-attainment Area."

MOB-8 [submitted by WFRC]: The WFRC supports approval of the mobile vehicle emission budgets (MVEBs) defined in Table 7.1 of Section 7.7 of the Salt Lake PM2.5 SIP provided that the SIP contains the emission trading mechanism established in the last paragraph of Section 7.7.

Response to MOB-8: DAQ appreciates the WFRC's support of the MVEBs in conjunction with an emission trading mechanism for the "Salt Lake City, UT Non-attainment Area" as submitted to EPA Region 8.

MOB-9 [submitted by Richard Valentine, Salt Lake County Health Department]: Believes that additional emissions reductions can be achieved via community leader and institutional support of carpooling.

Response to MOB-9: DAQ appreciates this input and supports the expansion of carpooling and other trip reduction measures aimed at reducing vehicle emissions.

MOB-10 [submitted by Ingrid Giffee, Utah Moms for Clean Air]: Ms. Giffee believes that DAQ should focus on health rather than simply meeting the NAAQS. She feels that the plan relies too much on Tier 3 automobile emissions standards and that air quality improvements will, therefore, be too slow in coming. Ms. Giffee feels that industry should be required to further reduce emissions.

Response to MOB-10: DAQ did not include Tier 3 automobile emissions standards in its modeling for the proposed SIP; the MOVES modeling for the proposed SIP only included Tier 2 and earlier vehicle emissions standards. Fortunately, these benefits are substantial enough to overcome the 33**%** growth in vehicle miles traveled throughout the period. The proposed Tier 3 standards would have additional emissions reduction benefits above and beyond those identified and relied upon for the demonstrating attainment in the proposed SIP.

MOB-11 [submitted by John Knoblock]: Mr. Knoblock is concerned that Utah doesn't have vehicle refueling vapor recovery systems at service stations.

Response to MOB-11: All new vehicles are manufactured with onboard refueling vapor recovery systems; EPA is in the process of phasing out Stage 2 vapor recovery systems at service stations, and such systems can actually cause problems with some types of onboard vapor recovery systems.

AREA SOURCE COMMENTS

(Comment numbers A-1 through A-2 are from Environmental Resources Management (ERM) on behalf of the Utah Manufacturing Association, the Utah Mining Association, and the Utah Petroleum Association.)

A-1: ERM asked for an explanation of why the VOC controls are being applied in Box Elder and Tooele counties, even though sensitivity model analysis show that VOC controls in those counties do not affect the PM2.5 measurements at the Hawthorn station.

Response to A-1: EPA advised DEQ to have all VOC area source rules apply to the entire PM2.5 nonattainment area.

A-2: ERM asked DAQ to consider the regulatory burden and costs associated with the new VOC area source rules concurrent with the SIP implementation requirements.

Response to A-2: Section 5.b, Control Strategies, Area Sources of the Technical Support Document, outlines this information as presented to the Air Quality Board. DAQ evaluated each strategy for technical feasibility and cost effectiveness of as part of the RACT analysis. This information was presented to The Air Quality Board, and the Board determined that each rule met the cost effectiveness requirement for RACT.

A-3 [Submitted by Nucor]: The application of VOC coatings handled in the rules, particularly due to the definition of VOC and baked coatings, creates adverse consequence.

Response to A-3: The definition of "VOC" and "baked coating" in the Air Quality Rules are taken directly from the CTG. Please refer to the TSD Section 5.b, Page 144 for our responses to similar comments when these rules were originally proposed.

A-4 [Submitted by Melanie and Kevin Pfister]: Agricultural burning needs to be prohibited in the entire state on days when the Clearing Index is less than 500, to bring it in line with other types of prescribed burning.

Response to A-4: The legislature has exempted agricultural burning from regulation under Title 19-2-114.

A-5: [Comment made by many commenters]: Several people submitted comments asking for more stringent wood burning regulations.

Response to A-5: DAQ developed a smoke strategy that listed all available options and conducted an analysis to determine the benefit vs social and economic impact. DAQ implemented the options which yielded the greatest immediate impact with the least social and economic hardship that would lead us to attainment. These include:

1) No longer allowing the use of EPA certified stoves on mandatory no-burn days.
2) Banning outdoor wood boilers in the nonattainment area and establishing set-backs for replacement of existing units. This is one of the most stringent rules in the country.
3) Lowering the threshold for calling red-day alerts to the lowest in the country.
4) Amending the wood burning rule to allow the Division to call a red-day alert before we reach the threshold based on our prediction of reaching the threshold level. Again, we are the only state that we are aware of that includes this type of provision in a smoke rule. The Director also has the ability of lowering the red-day alert threshold to an even lower level if need be.
5) Allowing only EPA Phase 2 approved fireplaces and wood stoves to be sold.

More stringent options that carry a significant economic burden are available for future consideration in the event that further action is deemed necessary.

A-6 [Submitted by Gabriel Lozada]: Mr. Lozada made the comment that cooking is a major direct source of PM2.5. Under-fire char broilers are not being regulated because it is expensive to do so. Restaurants should either convert to chain-driven char broilers so that emissions can be cost-effectively controlled or a regulation could restrict under-fire char broilers during inversions.

Response to A-6: Chain-driven char broilers limit the types of food that can be prepared using them. Consequently, they are not commonly used in commercial cooking. Full and semi-full service restaurants must use under-fire char broilers to prepare a variety of food types. Restricting the use of under-fire char broilers during inversions would essentially shutter the food industry.

Some California air districts are regulating very large under-fire char broiling operations. DAQ has evaluated this option and determined that the available technology is extremely expensive while only providing about 40% combined emission reduction. DAQ continues to monitor ongoing research and technology development to find a workable solution to under-fire char broiling emissions.

POINT SOURCE COMMENTS

P-1: Numerous comments were received regarding the establishment of SIP limits in Subsection IX.H.

Response to P-1: The comment period for the SIP limits in Subsection IX.H ends on December 2, 2013. Comments relevant to this subsection will be addressed at the end of that comment period.

P-2 [submitted by Procter & Gamble]: The written comments received from P&G addressed the RACT/RACM Evaluation Report for P&G. The comments addressed grammatical issues and in Section 5.c.iii of the Technical Support Document and provided a corrected emission distribution among the major equipment areas at the facility.

Response to P-2: The grammatical issues were corrected in the RACT/RACM Evaluation Report for P&G. The corrected emission distributions were updated. The emissions distribution does not affect the RACT analysis for the emission units analyzed for RACT, nor does the distribution trigger additional analysis. These comments were incorporated into the document to add clarity for the reader and to document the emissions as accurately as possible, in the report.

The following is the corrected emission distribution in Section 5.c.iii) RACT/RACM Evaluation Report;

Existing

Paper Machine (Each)	**PM10/2.5**	**NOx**	**VOC**
Roof Exhaust	7.80	10.60	3.52

Converting Room	**PM10/2.5**	**NOx**	**VOC**
Converting Room	0.00	0.00	102.49

Boilers for Paper Machines	**PM10/2.5**	**NOx**	**VOC**
Boiler 1	3.68	28.91	2.63
Boiler 2	3.68	28.91	2.63

Corrected

Paper Machine (Each)	**PM10/2.5**	**NOx**	**VOC**
Roof Exhaust	7.29	12.42	72.47

Converting Room	**PM10/2.5**	**NOx**	**VOC**
Converting Room	8.26	0.29	11.48

Boilers for each Paper Machine	**PM10/2.5**	**NOx**	**VOC**
Boiler 1	1.85	14.51	1.32

Boiler 2	1.85	14.51	1.32

[Comments P-3 through P-9 were submitted by Hexcel]
P-3: "P.3 **–** The descriptions are taken from the Fiberline 13 and 14 NOI and apply only to these fiberlines."

Response to P-3: It is unclear what specific descriptions the commenter is referring to, whether this is the entire description in section 1.2 which includes 3 pages or just page 3. The commenter has not provided a corrected description for the fiberlines. Comment is otherwise noted, no changes made to the RACT Evaluation Report.

P-4: P.4 (Section 1.4) **–** Based on a review of the 2008 AEI [Actual Emission Inventory] calculations, the reported numbers are generally lower than reported.

Response to P-4: It appears the commenter is suggesting that the actual emissions they reported to DAQ were overestimated, but the commenter does not suggest a change to the emissions. Comment is otherwise noted, no changes made to the RACT Evaluation Report.

P-5: The commenter points out three corrections to emissions on page 5 of the RACT Evaluation Report. All instances of the errors were provided.

Response to P-5: The commenter is correct and DAQ has made these corrections to the RACT Evaluation Report. These changes did not affect the determinations made in the RACT analysis because cost efficiency was based on the correct emission data; these errors were simply typos.

P-6: The commenter points out five corrections to cost efficiency on pages 9-10 of the RACT Evaluation Report. All instances of the errors were provided.

Response to P-6: The commenter is correct and DAQ has made these corrections to emissions and cost efficiencies. These changes did not affect the determinations made in the RACT analysis because in all instances the $/ton value was extremely high and the control identified would not have been selected for RACT under either the correct or incorrect cost efficiency.

P-7: "P.11 (PM2.5 + SO2 Venturi Table) – It appears that DAQ calculated cost/ton reduction based on SO2 Cost/total PM2.5 + SO2 tpy reduction. For most lines – cost to implement Venturi for SO2 was less than that for PM2.5 so this is a minimal estimate."

Response to P-7: This comment appears to simply be commentary on cost/total methodology but it is not clear to DAQ what the intent of the comment is. In conducting the RACT review the DAQ looked at costs from a single contaminant reduction and on a combined contaminant reduction basis to determine the amount of cost efficiency improvement by looking at multiple contaminants. This extra analysis did not result in a change to any RACT determinations. Comment is otherwise noted, no changes made to the RACT Evaluation Report.

P-8: "P.113 (Hexcel PTE summary Table) – PTE estimates have been included for Lines 15 and 16 – these are not imposed limits, but are included and are not currently conditions that Hexcel must meet. Hexcel does not believe that these estimates should not be included in the assessment. In addition, the emission estimates for Lines 15 & 16 mirror emissions from Lines 13 and 14 and do not account for the estimates sent to DAQ for these lines."

Response to P-8: The commenter is incorrect. DAQ assumes Hexcel did not include Lines 15 & 16 in their submitted RACT analysis because these lines have not been permitted yet. During the SIP development process, the projected emissions from Lines 15 & 16, based on emissions established for permitted Lines 13 & 14, were included for SIP modeling purposes as growth factors because the lines are projected to be in operation prior to 2019. However, the emissions from these two lines were later removed from the modeling due to a concern that they would be regarded as future offsets for permitting purposes. Lines 17 & 18 were never included in the modeling analysis because, according to the information provided by Hexcel, these unpermitted lines will not be in operation by 2019 and are therefore outside of the scope for this $PM_{2.5}$ SIP. Comment is otherwise noted, no changes made to the RACT Evaluation Report.

[Comments P-9 through P-12 were submitted by Pacific States Cast Iron (PSCIPCO)]

P-9: "[R]eviewing the likely economic forecast, we were able to develop a 2019 "true up" emission rate that is substantially less than what has been provided by DAQ as illustrated in Table 1. While we are calculating higher emissions of PM10 and PM2.5, we believe the DAQ values are in error and do not include condensable portions of PM10 and PM2.5 emissions." (p. 1)

Response to P-9: The commenter has not provided calculations or assumptions to justify their emission adjustments for 2019; therefore, DAQ is unable to review or verify the emissions provided in Table 1. However, condensable emissions were included in the 2008 actual emissions, which were carried over into 2014, 2017, and 2019 data used for SIP modeling. Condensable emissions for the Cupola were based on the 2011 stack testing data provided by PSCIPCO in its Actual Emission Inventory (AEI) report. In those AEI reports, PSCIPCO also used AP-42 emission factors that included condensable emissions for other PM emitting equipment. Therefore, DAQ relied on the PM emission (filterable and condensable) data provided by PSCIPCO in their AEI reports.

P-10: "It should be noted the DAQ Point Source Reduction Summary table appears in error. The table presents emission reduction of 129.1 tpy of VOC through the installation of a thermal regenerative oxidizer. The highest likely emission rate from Finishing Painting and Specialty Lining Painting combined would be less than that value." (p. 2)

Response to P-10: The commenter has not provided any justification or calculations to demonstrate the error it believes DAQ made. The VOC reduction of 129.1 tpy is based on 86% removal efficiency with Thermal Regenerative Oxidation on actual emissions of 145 tpy. The comment is otherwise noted, no changes made.

P-11: This comment addresses a re-evaluation of the Annealing furnaces RACT analysis. The commenter provides an adjustment to the total heat rating of the furnaces, provides documentation that the existing furnaces are LNB, the FGR is not technically feasible, and provides a cost analysis for alternative LNB technology which is not economically reasonable. (pp. 3-5)

Response to P-11: DAQ reviewed this additional information and incorporated it into the RACT Evaluation Report. Based on the information provided, DAQ has removed Low NOx burner with FGR as technically feasible for PSCIPCO. In addition, both the Low NOx Burner replacement (at 60 ppm) and the Low NOx Injection control options were included in the technical feasible RACT controls section. The table in Section 2.1 of the RACT Evaluation Report has been modified as noted below:

NOx Technically Feasible Control Options Cost Analysis Annealing Oven		
Control Option	**NOx (tpy) Reduction**	**Cost ($) / Ton Reduction**
Low NOx Burner Replacement (60 ppm)	**0.80**	**$188,710**
Low NOx Injection	**11.20**	**$32,834**

DAQ has modified the RACT recommendation to be GCP for NOx control at the Annealing ovens. In addition, the adjusted heat rating of 63.29 MMBtu/hr for the Annealing oven furnaces will be enforced in the AO.

P-12: This comment addresses a re-evaluation of VOC emission reductions from painting operations and indicates that control options are not economically reasonable. (pp. 5-9)

Response to P-12: PSCIPCO re-evaluated the painting operations at the facility, which includes Finishing Painting and Specialty Lining Painting operations. Due to lack of information from PSCIPCO, DAQ had combined these operations together in its October 2013 analysis. However, this new information indicates that it is infeasible to capture together emissions from both painting operations for control so PSCIPCO separated these operations because the operations are in two different buildings separated by approximately 600 feet. DAQ reviewed this additional information and agrees with this approach.

In this re-evaluation, PSCIPCO relied on VOC potentials to emit of 56.59 tpy for the Finishing Painting and 52.86 tpy for Specialty Lining Painting (total of 109.45 tpy). The basis for these potentials to emit was not provided but they are below both the PSCIPCO 2008 actual emissions reported in the AEI and the VOC limit of 260 tpy in the AO. In addition, while PSCIPCO had previously relied on 86% VOC removal efficiency, with this additional information they have relied on a 95% VOC removal efficiency.

The table in Section 2.4 of the RACT Evaluation Report has been modified by separating the painting operations into Finishing and Specialty Lining painting operations as noted below:

VOC Technically Feasible Control Options Cost Analysis Finishing Painting		
Control Option	**VOC (tpy) Reduction**	**Cost ($) / Ton Reduction**
Catalytic Regenerative Oxidation (95%)	**53.76**	**$64,495**
Catalytic Recuperative Oxidation (95%)	**53.76**	**$82,220**
Thermal Regenerative Oxidation (95%)	**53.76**	**$69,763**

Cost estimations are based on total VOC emissions of 56.59 tpy

VOC Technically Feasible Control Options Cost Analysis Specialty Lining Painting		
Control Option	**VOC (tpy) Reduction**	**Cost ($) / Ton Reduction**
Catalytic Regenerative Oxidation (95%)	**50.22**	**$68,921**
Catalytic Recuperative Oxidation (95%)	**50.22**	**$87,709**
Thermal Regenerative Oxidation (95%)	**50.22**	**$74,496**

Cost estimations are based on total VOC emissions of 52.86 tpy

These control options have been determined by DAQ to be economically infeasible.

The most current AO limits the Cupola, Annealing Oven, and painting operations to 260 tpy. This limit has been adjusted to include the proposed painting operation potentials to emit that were relied on in the RACT analysis.

DAQ has modified is RACT recommendation to be as follows: *"Because PSCIPCO relied on a VOC potential to emit of 109.45 tpy for all painting operations, below both the 2008 reported actual emissions and existing permitted allowable emissions, PSCIPCO will be limited to this VOC value. Taking into considering the Cupola (7.18 tpy), Desulfurization (0.5 tpy), Annealing Ovens (1.53 tpy), and the painting operations (109.45 tpy), the new VOC limit will be 118.66 tpy. DAQ recommends this VOC limit as RACT for painting operations"*

Based on the comments received and adjustments made to the RACT analysis, the table in Section 3.0 has been modified to be as follows:

RACT Proposed Emission Reductions (ton/yr)				
Process - Control	**$PM_{2.5}$**	**SO_2**	**NO_x**	**VOC**
Painting Operations- Limit on VOCs	**--**	**--**	**--**	**141.84***
Total Reductions	**0.0**	**0.0**	**0.00**	**141.84**

**Based on the previous 260 tpy VOC limit*

P-13 [submitted by Geneva Nitrogen (Geneva)]: Geneva commented that they are proposing to construct a package ammonia plant at the nitric acid and ammonium nitrate production facility. The ammonia plant will produce commercial anhydrous ammonia using natural gas as the feedstock. There will be only two emission sources from this plant; a primary reformer and an amine regenerator. Construction of the ammonia plant is planned for 2015.

Response to P-13: The projected Geneva 2019 emissions modeled in the $PM_{2.5}$ Utah County SIP, as proposed by Geneva, included emission from this proposed operation in place of REMI growth.

A RACT analysis, including an economic analysis, has been performed and included for the proposed package ammonia plant. The results of the RACT analysis demonstrate that the Primary Reformer (largest source of natural gas combustion emissions from the ammonia plant) shall install Ultra Low-NO_x Burner (ULNB) technology and achieve a NO_x emission limit of 0.05 lb/MMBtu.

No changes were made to the SIP as both the modeling analysis and the RACT analysis were conducted appropriately. Geneva will be required to submit an NOI and follow the required permitting procedures (R315-401-8) prior to installation of the ammonia plant.

P-14 [submitted by Kennecott (KUC)]: KUC believes that DAQ imposed RACT-based controls at higher dollar-per-ton-values than have been established in previous SIP actions. We question whether doing so is justified or appropriate. This is particularly true at the Bingham Canyon Mine where the RACT analysis requires controls that do not exist.

Response to P-14: The dollar-per-ton-value was established based on a reasonable cost estimate that was conducted by DAQ management.

When KUC replaces their haul trucks at the Bingham Canyon Mine, they will be required to replace them with the highest tier level available. Currently they have tier 1 and tier 2 trucks. Caterpillar stated that they would have tier 4 trucks available by 2016 and Komatsu should be available around the same time frame. While tier 4 trucks may not be available now, by the time KUC will be required to replace their trucks, the higher tier models will be available.

P-15 [submitted by Silver Eagle]: Silver Eagle believes General Refinery Requirement H.11.a.v. Paragraph B, requiring all refineries to install flare gas recovery exceeds technical and economic basis for RACT.

Response to P-15: The comment is a two-fold comment. Although, the commenter is commenting on the refinery flare gas requirement broadly as being excessive, the subtext of the comment letter makes it clear that the commenter believes that the requirement to install flare gas recovery should not apply to the Silver Eagle Refinery specifically due to its unique nature as a synthetic minor source. DAQ addresses each of these concerns separately.

When looking at flare gas recovery systems in a broad sense, it is the intention of the Division to limit the use of hydrocarbon flares to serve only as safety and emergency-use control devices. Routine hydrocarbon flaring is viewed as a source of combustion related emissions which can be controlled through the use of flare gas recovery systems at a relatively low cost. Although DAQ acknowledges that this cost can vary widely from refinery to refinery, the overall strategy of flare gas recovery is not negated by the example cost benefit analysis of a single source.

However, DAQ agrees that a cost analysis of $120,526/ton of combined VOC, PM10 and PM2.5 emissions does appear to be excessive, although the commenter did not provide a detailed analysis for DAQ to review. Instead, DAQ returned to the 2008 “true-up” emission inventory prepared for Silver Eagle prior to that source’s latest permitting action pursuant to becoming synthetic minor. The combined emissions of the North and South Flares located at Silver Eagle yield the following emission totals (all values in tpy):

PM10 = 0.01, PM2.5 = 0.01, SO2 = 0.002, NOx = 0.1, VOC = 0.2

Based on these emission totals, and acknowledging that following completion of Silver Eagle’s latest permitting action the source will be both a synthetic minor source and have individual potential emissions of less than 70 tpy for PM2.5 as well as all PM2.5 precursors, DAQ agrees that General Refinery Requirement H.11.a.v. Paragraph B should not apply to minor source refineries. The comment is noted and the language will be adjusted to reflect this change.

P-16 [submitted by George Chapman]: Nearby stationary emission sources like cement kilns (Weber) and Layton Burn Plant and Stericycle should be added and should be required to not burn during red week periods. Also, we have 3 coal fired plants in SLC. They should also be offline during red weeks.

Response to P-16: DAQ appreciates these suggestions and would like to assure you that coal-firing in the nonattainment area is already not permitted during the winter season (November – February). While some of the other ideas may seem attractive, the Clean Air Act does not allow what are called “episodic controls,” meaning those based on ambient conditions.

P-17: [submitted by submitted by Physicians for a Healthy Environment, Friends of Great Salt Lake, CleanAirNow!, The U. Student Clean Air Network and Western Resource Advocates; collectively “Utah Physicians”]: Nowhere in the PM2.5 SIPs is there any acknowledgement of or accounting for the increase in diesel emissions from the hundreds of truck trips bringing in the black wax crude substrate for the refinery expansions.

Response to P-17: DAQ agrees that no specific line item labeled “truck diesel emissions” appears under the individual refinery RACT analyses. Similarly, no such line item will appear in the individual emission inventories for any of the refineries – either in the “true-up” baseline or in any of the projection year inventories (2014, 2017 or 2019). The reason for this is that these emissions do not belong to and cannot be associated with a particular refinery.

First, the vehicle exhaust, or what is known as “tail pipe emissions” are the concern of the owner of the vehicles, and not the individual refinery which happens to receive the crude oil delivery. As a source, the refinery is not responsible for the care and maintenance of those vehicles.

Under the permitting structure of the Clean Air Act the refineries are considered stationary sources, and as such are regulated under Title I of the Act. Vehicles are considered mobile sources, and are regulated under Title II of the Act. Similarly, under the SIP, mobile sources are separated from point and area sources in RACT/RACM analyses and treatment within the attainment demonstration.

Growth in on-road mobile vehicle emissions – including that from truck traffic – is estimated by the metropolitan planning organizations and is included in the emissions inventories that the MPOs submit to DAQ for use in SIP air quality modeling.

P-18 [submitted by Utah Physicians]: Almost all of the RACT analyses are insufficient because they fail to consider improved monitoring methods, better leak detection, advanced means of discovering equipment failures and more frequent monitoring programs as measures that have the potential to reduce emissions.

Response to P-18: DAQ disagrees with this comment. When considering RACT/RACM, improved monitoring detection was of great concern. One needs only refer to the Refinery General RACT Report which discusses the implementation of both low-leak LDAR and the MACT CC requirements on cooling towers as means of lowering VOC emissions. These two programs focus almost exclusively on monitoring and early detection/repair as a means of reducing both overall VOC emissions as well as reducing VOC emissions as quickly as possible. DAQ's goal was to require these programs for all refineries in the nonattainment areas regardless of current or eventual NSPS/NESHAP applicability, and the Refinery General RACT Report discusses this in detail.

P-19 [submitted by Utah Physicians]: The RACT analyses fail to take a hard look at existing control technology that the Director claims is RACT. In assessing available control measures, areas that are current non-attainment areas for PM10, additional control measures exist because sources in these areas have been required to focus on particulate matter that is filterable at stack temperatures and thus have not adequately controlled condensable emissions. Similarly, emission controls designed to capture coarse PM can be updated with new technologies aimed at controlling fine PM – technologies that have advanced significantly over the last 15 years.

Response to P-19: DAQ disagrees with this comment. The commenter gives no examples of control technologies that have significantly advanced and could be evaluated as RACT. Combustion, with the associated creation of acid gases, metal vapors and some organic materials is the primary source of condensable particulate emissions among the point sources included in the RACT analyses. Control of these types of emissions is a two-fold process.

The first step involves the elimination of items in the fuel which could lead to potential condensable emissions. Many of the point sources listed in the SIP were at one time allowed to burn higher sulfur diesel or coal. With the elimination of these fuel types through regular NSR permitting, the associated acid gas and metal vapors condensable emissions are not present even before other RACT considerations are taken.

An example of the progress in moving to the use of clean fuels, only two sources in the non-attainment area are permitted to burn coal, the KUC Power Plant and BYU's Central Heating Plant. In the KUC Power Plant case, three coal-fired boilers are being replaced by a single natural gas-fired turbine. In the BYU case, DAQ determined that a RACT analysis was not required for the coal-fired boilers, as permitting actions undertaken since the previous SIP had imposed a seasonal restriction on burning coal. This seasonal restriction disallows the use of coal as a fuel during the winter months of greatest concern.

The second step for control of condensable emissions is post-creation control. Condensable emissions, by definition, cannot typically be removed or controlled through the usual particulate controls which rely primarily on dry filtration methodologies, such as baghouse-type fabric filters, cyclones, or ESPs. Instead, wet filtration methods, or wet gas scrubbing, where some type of direct gas absorption can occur is what is needed.

This is discussed particularly in the RACT analyses for both Holly Refinery and Tesoro Refinery, both of whom are installing wet gas scrubbers as a control methodology for removal of particulate emissions from their respective FCCUs. Both refineries are also installing LoTOx units in combination with the wet gas scrubbing systems. These units work in conjunction with the wet gas scrubbers to control NOx emissions and represent the current highest level of control for add-on control systems.

MODELING

(Comment numbers M-1 through M-16 are from Environmental Resources Management (ERM) on behalf of the Utah Manufacturing Association, the Utah Mining Association, and the Utah Petroleum Association. Comment M-17 and M-18 were made by Kennecott)

M-1: ERM states that temperature and moisture play an important role in the chemical formation of PM2.5. They state that evaluation of the WRF meteorological model humidity data should be presented. ERM also states regional (rural) temperatures should be look at in addition to urban locations. Re-evaluation of surface temperature and humidity may provide better spatially representative results, and thus DAQ could avoid artificially restricting model vertical advection.

Response to M-1: All surface humidity and temperatures within Northern Utah valley basins were carefully examined. Through model sensitivities examining surface temperature and humidity, DAQ found that these physical variables were not the most important variables in terms of high PM2.5 during wintertime inversions.

The most important physical characteristics that must be properly simulated to replicate the high wintertime episodic PM2.5 in Utah valley basins are:

1) The strong vertical temperature stability (inversion) to allow the for the buildup of precursor emissions and formation of PM2.5 near the surface
2) Snow covered surface albedo that is needed for the photochemistry in the formation of secondary PM2.5 (nitrate)
3) Light wind speeds.
4) The diurnal wind direction patterns in the valley basins.

DAQ sees good model performance for the winds (#3 and #4). However, 1) and 2) were difficult for the model replicate. Numerous (over hundreds in fact) of model sensitivities were performed as tests to see how DAQ could improve the model to better replicate the temperature inversion and surface albedo. The **only** sensitivity that allowed for the proper buildup of PM2.5 precursors was the de-activation of vertical advection.

M-2: ERM states that the WRF meteorological modeling under-predicts the local wind speeds and does not replicate the nighttime wind direction at two monitor locations. The under-prediction of winds may lead to an over-prediction of modeled PM2.5 concentrations at monitor locations.

Response to M-2: WRF does slightly under-predict the local winds speeds during PM2.5 episodic events. The under-prediction of the WRF nighttime winds is typically less than 1 mile per hour, which is quite small and shows that WRF is able to actually capture the low (almost calm) wind speeds that occur during the PM2.5 episode. Replicating these low winds speeds is important for the photochemical model to build PM2.5, and DAQ believes the slight under-prediction of WRF winds does not lead to an over-prediction of modeled PM2.5 concentrations.

M-3: Only four monitoring locations are shown in the WRF meteorological evaluation in the SIP. It would be of help to include more monitoring stations in the analysis.

Response to M-3: DAQ did the WRF evaluation at all sites in the DAQ Air Monitoring Network that collects meteorological data. DAQ chose to show the analysis of a representative monitor in each non-attainment area in the domain (Cache, Salt Lake, Utah, and Weber Counties). All other monitors are located in these non-attainment areas and showed similar performance as the four representative monitors.

M-4: The SIP indicates that DAQ uses EPA default initial boundary conditions in the CMAQ photochemical modeling. ERM suggests the EPA default initial boundary conditions may not be the best representative of the Western U.S. modeling domain. ERM suggests reviewing other areas of the Western U.S. (e.g., San Joaquin Valley) to see if an improvement can be made to defining initial boundary conditions.

Response to M-4:
Based upon sensitivity testing of initial and boundary conditions done early in the model development phase, it is DAQ's position that boundary conditions have little effect on the models ability to simulate episodic high PM2.5 events. The beginning of these events has extremely low background levels of PM2.5 and its precursors. The buildup of PM2.5 is attributed to the locally driven temperature inversion and locally generated emissions.

M-5: ERM states the importance of pre-episodic emissions warrant reevaluation, as they may be important in the models prediction of PM2.5 concentrations.

Response to M-5: The modeled period from December 11, 2009 – January 17, 2010 actually encompasses four distinct episodes. For that reason there are clearly pre-episodic and pre-frontal emissions included in the modeling analysis.

M-6: The default model surface albedo is modified to better represent the snow covered inversion conditions during episodic events. A modeling sensitivity analysis on various albedo values should be performed to assess its effects on model PM2.5 predictions. This may eliminate the vertical advection restriction used in the CMAQ modeling.

Response to M-6: A series of model sensitivity analyses on various albedo values were performed in 2008 with the results presented at the annual CMAS conference. See: http://www.cmascenter.org/conference/2008/abstracts/cruickshank_cmaq_sensitivity_cmas08.pdf

The snow covered surface albedo does effect the model PM2.5 prediction. DAQ carefully analyzed the results of the model sensitivities, and concluded that a surface albedo of 0.55 best approximates the typical albedo of the Wasatch Front in wintertime.

M-7: CMAQ simulations show a significantly higher percentage of nitrate in the Logan area (Cache Valley) than in all other locations. An explanation for the basis of this anomaly and why it occurs at this location should be addressed.

Response to M-7: DAQ does not consider this result an anomaly. Analyses of multi-year data sets of observed $PM_{2.5}$ and speciated $PM_{2.5}$ components show a number of consistent trends. One is that when the Logan monitor exceeds the NAAQS $PM_{2.5}$ nitrate concentrations are more often higher than those observed in Salt Lake City and other Wasatch Front monitors. Further, as a general rule, at all monitors, as total PM2.5 concentrations increase the proportion of ammonium nitrate also increases as a share of the whole.

M-8: ERM states it may be helpful to have a discussion in the SIP showing the percent difference in model performance for the various schemes that UDAQ used to ultimately define the specific 17 vertical cells.

Response to M-8: DAQ performed an analysis of CMAQ model performance with the full 36 WRF model vertical layers and the layer collapsing method that re-structures the vertical layers to 17. The analysis showed minimal to no changes in the model predictions of PM2.5 within the first model layer.

CMAQ photochemical modeling runs are very computationally expensive, and the layer collapsing method afforded DAQ the time to perform additional modeling that targeted improving model performance and the evaluation of numerous control strategies.

M-9: ERM has concerns regarding the elimination of vertical advection in the CMAQ model and the lack of discussion in the SIP on how that would affect diffusion of emissions from one vertical cell to another.

Response to M-9: The elimination of vertical advection does limit the advection of emissions from the surface grid cell to the above vertical layer, which actually mimics the wintertime inversion better than when vertical advection is activated. This elimination of vertical advection allows for the more realistic buildup and better model performance of the precursors (NOx and VOC) of secondary PM2.5.

Without the restriction of vertical advection, the emissions within the model are transported out of the lowest model grid cell and model performance is poor.

M-10: The TSD does not provide an adequate basis for the overall emissions calculated for the aircraft and the spatial extent of these emissions.

Response to M-10:
See:
http://www.airquality.utah.gov/AirPollutants/ParticulateMatter/PM25/SaltLakeProvo/docs/tsd/chapter4/4_b_SMOKE_EMISSIONS_MODEL%20091913.pdf sections 1.3- 1.6 relating to spatial surrogates.
See:
http://www.airquality.utah.gov/AirPollutants/ParticulateMatter/PM25/SaltLakeProvo/docs/tsd/chapter3/3d/3_d_i_Nonroad_2010%20Baseline%20and%20Projection%20Year_TSD_V2.pdf TSD for the "non-Road" inventory and the use of the NONROAD model.

M-11: UDAQ modified the modeling scheme to exclude vertical advection in order to get better model performance. Other factors besides excluding vertical advection may improve model performance. These include better predictions of the low level temperature and winds.

Response to M-11: DAQ appreciates the concern regarding the elimination of vertical advection. We share that concern as do all of the various atmospheric scientists that we consulted with on this issue. Since 2000, when DAQ began modeling inversion conditions, we have contracted, consulted, and collaborated with atmospheric scientists on a wide variety of issues related to our meteorological modeling. This includes issues of vertical resolution. Some of the meteorological groups we have worked with include the University of Utah, Dugway Proving Grounds, the National Center for Atmospheric Research (NCAR), EPA Regions 8 and 10, EPA Office of Research and Development, and EPA Office of Air Quality Planning and Standards.

The most important physical characteristics that must be properly simulated to replicate the high wintertime episodic PM2.5 in Utah valley basins are:

1) The strong vertical temperature stability (inversion) to allow the for the buildup of precursor emissions and formation of PM2.5 near the surface
2) Snow covered surface albedo that is needed for the photochemistry in the formation of secondary PM2.5 (nitrate)
3) Light wind speeds.
4) The diurnal wind direction patterns in the valley basins.

DAQ sees good model performance for the winds (#3 and #4). However, 1) and 2) were difficult for the model replicate. Numerous (over hundreds in fact) of model sensitivities were performed as tests to see how DAQ could improve the model to better replicate the temperature inversion and surface albedo. The **only** sensitivity that allowed for the proper buildup of PM2.5 precursors was the de-activation of vertical advection.

M-12: The SIP indicates that there is good correlation between predicted and observed concentrations for the modeling domain, citing an overall greater than 0.5 correlation coefficient. It may be useful to provide a basis for this comparison, since in statistical terms a 0.75 correlation represents the minimal value in defining representative correlations.

Response to M-12: The CMAQ performance is based on the following evaluation metrics developed for air quality models:
See: http://www.sciencedirect.com/science/article/pii/S1352231006000690
DAQ's CMAQ performance of the normalized error and bias for modeled PM2.5 passes the performance goals set aside by this above reference (Boylen and Russell, 2006). DAQ is not aware of any performance goals that have been established for the correlation coefficient in terms of the air quality modeling of PM2.5.

M-13: The SIP should provide a discussion of the NOx/VOC ratio and relationship, the effects of the changes in the NOx/VOC relationship, and the impact on the reductions of each relative to overall PM2.5 reduction.

Response to M-13: Section 1.3 of the Weight-Of-Evidence TSD titled "Observational Analysis of NOx – VOC Chemistry" provides a discussion of the NOx/VOC relationship and impact of the reduction to each relative to a reduction to particulate nitrate.

M-14: In the SIP, growth patterns are based upon factors that project growth in populated areas. However, rural areas present a different growth pattern. The SIP should contain a discussion of these differences.

Response to M-14: All growth projections are based on projections from the Utah Governor's Office of Management and Budget (GOMB). These are county-specific projections so if a county is primarily rural that is no doubt factored into the GOMB methodology.

M-15: The SIP provides a summary of the overall effect of the control measures in all areas. It would be helpful to discuss the effects of each control measure for each sub-region. Providing region wide reductions does not provide sufficient information on the effectiveness of each control measure to individual sub-regions.

Response to M-15: It has been DAQ's experience, through many hundreds of simulations on the episodes in this SIP alone, that useful source/receptor relationships would not result from a sub-regional analysis. DAQ's view is that analyzing effects at the scale of separate non-attainment areas is the appropriate scale for assessing the effectiveness of control strategies. To some extent the effect of control strategies at a "sub-regional"level is characterized by modeled $PM_{2.5}$ concentrations at the individual air quality monitors. Further, "sub-regional" analysis is

accounted for in the unmonitored area analysis described in Section 1.5 of the Weight-Of-Evidence TSD.
http://www.airquality.utah.gov/AirPollutants/ParticulateMatter/PM25/SaltLakeProvo/docs/tsd/chapter4/4_e_WeightofEvidence_TSD_09192013.pdf

M-16: The SIP does not discuss the varying effects of NOx, SOx and direct PM2.5 emissions on the overall concentrations and the effects of the control measures on these emissions. It would be helpful to have an analysis and discussion for these pollutants, as it is important in defining overall control strategies that are effective and efficient. An example is the control measures that could change the NOx/VOC ratio, which in turn will change the production of the nitrate formation.

Response to M-16
Section 1.3 of the Weight-Of-Evidence TSD titled "Relative Contributions of NOx, VOC, and direct PM2.5 Emission Reductions to the Simulated Controlled 2019 Future Year 24-hr PM2.5 Concentrations" provides a discussion of the varying effects of NOx, VOC and direct PM2.5 emissions on the overall concentrations and the effects of the control measures on these emissions.
http://www.airquality.utah.gov/AirPollutants/ParticulateMatter/PM25/SaltLakeProvo/docs/tsd/chapter4/4_e_WeightofEvidence_TSD_09192013.pdf

M-17: Kennecott commented that modeling for the PM2.5 SIP was performed using a photochemical model called CMAQ.

Even though the model is not capable of characterizing activity of a complex source such as the Bingham Canyon Mine (BCM), the BCM was modeled within the assumptions of the model. The model has predicted some localized elevated modeled concentrations of PM2.5. These concentrations are understood to be an artifact of the modeling process rather than an expected actual condition.

A detailed modeling analysis of Bingham Canyon Mine requires algorithms beyond the scope of CMAQ. The TSD recognizes, to some degree, the likely over-prediction of the CMAQ model. Thus, the TSD explains that DAQ will install an air quality monitor either within, or very close to, modeled elevated concentrations to obtain actual ambient concentrations. Following is additional information elaborating on the reasons for the likely over-predictions of the CMAQ model for areas in the more immediate vicinity of the pit

Based on the PCAPS study, the meteorology during strong inversion conditions will tend to decouple emissions originating in the BCM from air quality in the valley floor thereby minimizing dispersion below the edge of the mine (Reference PCAPS presentation at http://pcaps.utah.edu/docs/DAQ talk 02162012 Whiteman.pdf - particularly slide 36, also attached). Also, the low point of the pit is at an elevation that is higher than the typical valley inversion ceiling. During an inversion, the air mass in the BCM is warmer than in the valley. When a mix out occurs, the warmer buoyant air mass from the BCM raises out of the mine and therefore would not settle in the valley.

For the BCM, combined emissions of PM2.5, NOx, SO2 and VOC were modeled in CMAQ during strong inversion episodes. It should be noted that only primary PM2.5 emissions estimates assume retention factors in the BCM. Primary PM2.5 emissions account for only 6% of emissions at the BCM. Calculations of emissions of gaseous pollutants, NOx, SO2 and VOC do not assume any retention in the BCM. Because meteorological observation indicates decoupling of all BCM emissions from valley air quality, but modeling accounts for this tendency for only six percent of emissions, emissions modeled in CMAQ represent a very conservative emissions profile for the BCM. It is therefore believed that modeled localized impacts in the vicinity of BCM represent an artifact of the modeling process rather than an expected actual condition. If actual impacts from the BCM are observed, a detailed local modeling analysis could be conducted using a more appropriate modeling tool.

Response to M-17: CMAQ uses sophisticated state-of-the-art numerical methods for simulating the physical and chemical processes that govern our atmosphere. CMAQ is perfectly suited to small, urban-scale estimations of fine particulate matter, such as the ones provided in our SIP. A lot of effort and collaboration went into bringing forth the best possible modeling results for our SIP work.

It is not DAQ's intention to produce a detailed modeling analysis of the BCM. Such an analysis goes beyond the scope of the unmonitored area analysis (UAA), which is to discover whether future violations of the NAAQS can arise in areas where no PM2.5 monitor currently exists. Where possible, the UAA is designed to simulate the EPA's modeled attainment test. Using a completely different air-quality model for the UAA would not adhere to the conformity expected between the UAA and modeled attainment test.

Although it's possible that the large PM2.5 concentrations attributed to the grid-cell could be due to an artifact in the model, we are not certain there is an overestimation of secondary PM2.5 there. Even though the BCM is near the grid-cell, it should be noted that Kennecott's Copperton Concetrator facility is actually located inside the "violating" grid-cell. Although primary PM2.5 makes up a relatively small portion of criterion pollutants emitted from the BCM, it is still a significant amount.

While DAQ agrees that the Salt Lake valley basin is generally decoupled from the BCM during wintertime inversion events, this is not always true. The atmospheric dynamics between the two air-sheds is too complex to be encapsulated in only one study—a study that examines only one particular meteorological episode. Examining the attached PCAPS presentation, it is apparent that there are periods where the BCM's aerosol layer height extends above the Bingham Canyon Low Pass (see slide entitled "1-9 January 2011 aerosol heights"). This implies that there is not a strict decoupling of the two air-sheds.

It is also not well understood what happens during successive inversion episodes. Can outflow from the BCM get trapped in the Salt Lake valley air-shed during consecutive cold-pool episodes? PM2.5 has a low settling velocity and can travel large distances over time. In essence, effectively quantifying how much emissions from the BCM enter the Salt Lake valley would require an extensive amount of further study. An ambient monitor placed near the vicinity of the

UAA violation should help mitigate modeling uncertainties by better characterizing Salt Lake valley pollution.

The issue of emissions retention at the BCM was discussed with Kennecott and it was agreed DAQ would apply retention factors to primary PM2.5 and PM10 only. It was not proposed by DAQ or Kennecott to apply retention factors to other criterion pollutants. To be clear, the portion of primary PM2.5 at the BCM that is considered “retained” is not modeled in our SIP.

M-18 [submitted by KUC]: The basis for DAQ’s modeling procedures and methodology appears to be EPA’s Guideline on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze. Under this modeling guidance EPA directed modelers to base their projections of future emissions on a “reasonable projection of future-year emissions” and not on the worst-case scenario of emissions that a modeler can conceive; for example, all sources operating at maximum allowable emissions all at the same time. KUC believes that DAQ’s modeling for future-year projects complies with EPA’s modeling guidance, as it provides a reasonable projection of the emissions that will occur in 2014, 2017, and 2019.

Response to M-18: The commenter is correct that DAQ applied the guidance contained in the referenced document. DAQ believes the guidance makes this particular recommendation because of the chemical reactivity of both PM2.5 and ozone. In both cases, the chemistry is non-linear, and model predictions regarding concentrations of these pollutants are functions of the chemical equilibrium present at any given time in the airshed. Overly conservative projections of emissions can misrepresent this equilibrium and lead to erroneous model results. DAQ was mindful of making reasonable projections in the future-year emissions, and did not use an overly conservative representation of permissible emissions from stationary sources. The modeling analysis also accounts for permitting actions that transpired between the 2010 baseline and now. This accounting is consistent with the notion of a reasonable projection.

TECHNICAL SUPPORT DOCUMENT

TSD-1 [comment submitted by DAQ]: During the public comment period, DAQ staff conducted internal review of this document and decided that a few minor changes to the document would improve it. Those minor changes include the following:

1. Colored graphs were added, which show the non-road mobile source inventory by pollutant for the base year and projection years by main groups:

a. Emissions from equipment in EPA NONROAD Model
b. Aircraft emissions
c. Locomotives (diesel) emissions

The graphs are an easy way to visualize the main groups comprising the non-road mobile source inventory.

2. Minor changes were made to the discussion about emissions from snowmobiles to make it easier to understand. The snowmobile inventory comes from the EPA NONROAD Model.

3. No changes were made to any of the emissions values (tons per year).

TSD-2 [submitted by DAQ]: A wrong file from MAG was inadvertently included in the CD of Inventory Data files that is part of the TSD and made available for public comment. This has been corrected in the final TSD.